App F IX 4

1945 ms

File No 149-45

Previous References Rel 90-41 (3, 1,) (Rel)

Serial Nos 41, 42, 75, 76

Later References

GENERAL AND REVENUE SECRETARIAT

Serial Nos 70 ms

Part B for Revenue

SUBJECT

Financing of the Bangalore-city Drainage Scheme

d 12711 dy 16.5.45

The Comptroller's post

(Mr. Pl. Secy)

Request that a provision of 3.00 lakhs be provided in the Budget for 1945-46, a similar amount being Contributed by the B'lore

From the D P H
--- No C 81 - 1708 dt 1-12-44
forwards proposals for carrying out the remaining portion of the comprehensive drainage scheme in Bangalore city towards which a sum of Rs 21,06,126/- is said to be required

A 1) In G.O. dt 1-11-41 sanction was accorded to an estimate for Rs 41,24,441 for the comprehensive drainage scheme in B city

2) It is seen from the reports now received from the D P H that of the G.O. contribution so far made amounts to Rs 10 lakhs and the B city Mcl should have contributed Rs 10,18,315/=

3) Out of the total amount of Rs 20,18,315 thus placed at the disposal of the Special Officer, B city Drainage Works, work to the extent of Rs 18,23,619/= is said to have been executed, leaving a balance of Rs 1,94,696/=

4) Apart from the amount on hand, the D P H reports that a further sum of Rs 21,06,126/- is required to execute the remaining portion of the drainage scheme during the next three years

P T O

while sanctioning the scheme, it was considered not desirable to give as govt grant half the cost of the entire scheme and the govt grant was then limited to Rs 10 lakhs with the observation that the question of financing the remaining portion of the scheme should be considered after the year 1942-43

~~In the above circumstances,~~

5) As promised by the govt, a sum of Rs 10 lakhs has already been paid. In order to complete the scheme, a sum of Rs 21,06,126/- is ~~to~~ still required. It is now for orders as to what extent govt should contribute towards the balance of Rs 21,06,126/- required to complete the Scheme

6) subject for perusal

7) Memorandum of the Director of Public Health may be awaited till the end of January 45

Law Secy) 29/12/44

8) May be awaited till the end of Jan 45

Minister 31/12

9) Orders received

Secy 8-1-45

Forwarded to Min. for info.

10) Min. for info.

OFFICE OF THE MINISTER FOR PUBLIC HEALTH & LAW
- 3 JAN 1945
Volume 1383
SECY LAW DEPT
S 186
2/1/45

Continuation Sheet 2 — File No 3768 — Current No 7148 — Bangalore city Drainage — of — Page

11) A dft reminder as pointed out — Ref. para 9 supra
Mea 27/1

12) Dft reminder 27/1/45

To,

The Md Comm B. city
L 7552 & 30-1-45-
calls for certain information

Sub A
Mea 5/2

Letter no CG. 149/RL/44-45 dt 28.4.45
from the Dr & Secy Public Health
requesting early orders in regard
to the further financing of the
Bangalore city Drainage scheme

(3) The opinion of the Md called for
from the Md Comm has not been
received inspite of reminders

(4) A do. reminder is submitted for appl
Ulka
2/5

(5) Dft Md attached
for
3/5/45

Signed No L 10941 dt 4/5

TYPII
3 MAY 1945
Sub A

Letter no A1 1031/38 dt 5-5-45 from
the Md Comm, Bang, furnishing
the information

(6) It is reported that the Md have
resolved that an amount equal
to the Govt contribution might
be paid annually as hitherto,
necessary provision being made

3768 ✓ 71485 ✓ 7313

Continuation Sheet | File No / Current No | of | Page

in the Budget

11, submitted for orders with reference to paras 8 & 9 supra

KHS 1945 | The previous file being in the subject may be put up, with a detailed note in the matter. Pl do it quickly. This is an important question, which should be attended to without delay

Sd/- 16/5/45

1) In the G.O. dated 1-11-41, sanction was accorded to an Estimate for Rs 41,24,441/ for the Comprehensive underground Drainage Scheme in the Bangalore City. Government have so far contributed a sum of Rs 10 lakhs and the Bangalore City Municipality have contributed a sum of Rs 10,18,315, towards the above Scheme. An expenditure of Rs 20 18 315/ has already been incurred.

The Director of public Health has requested that the balance grant of Rs 21,06,126, may be allotted to execute the remaining portion of the Comprehensive Drainage Scheme, during the next three years.

While sanctioning the Scheme it was considered not desirable to give as Govt. grant half the cost of the entire Scheme and the Government grant was then limited to Rs 10 lakhs, with the observation that the question of financing the

remaining portion of the Scheme would be Considered after the year 1942-43

2) The Municipal Commissioner, Bangalore City, has intimated that the municipal Council have resolved that an amount equal to the Government contribution might be found annually as hitherto

3) It is now for orders as to what extent Government should contribute towards the balance of Rs 21,06,126/- required to complete the Scheme.

a comprehensive City Drainage Scheme prepared by the Municipal Chief Engineer is put up in 295

295 95 A Comprehensive Scheme for the underground drainage Scheme System was sanctioned in Govt No 3422-26/Mnl 40-41 dated the 18th Nov 1941 The cost was estimated at Rs 41,24,441

96) The Govt have made a total Contribution of Rs ten Lakhs towards this work up to the end of June 1944-45 The Municipal Council have contributed a sum of Rs 10,18,315 The outlay upto 1st December 1944 is reported to be Rs 18,23,615, leaving a balance of Rs 1,94,696/- for expenditure during the current year. This subsequently

reported that the entire sum of Rs 1,46,96 has been spent & an addl grant of Rs 70,000 would be required for the purpose during the current year. This question is being worked up separately.

(iii) In the same G.O. dated 1.11.1941, it was directed that the question of financing the remaining portion of the scheme after spending about Rs 20 lakhs would be considered after the year 1942-43. The Dir. of P.H. has accordingly raised this question as to the ways & means of financing the scheme hereafter. The M.L.C.W. Board has forwarded a copy of the resolution of the Bd dated 23-4-42 to the effect that an amount equal to the Government contribution might be paid annually as hitherto, necessary provision being made in the Budget. Based on this resolution & on the basis of the information obtained from the M.L.C.W. a provision of Rs 1.55 lakhs has been made in the State Budget for 1945-46 under "Rural Water Supply Improvement and Drainage works". It is stated that a similar provision has been made in the Budget Estimates of the Board of M&S for 1945-46

7310/.

c) for the year 1945-46, a sum of Rs 1,55 lakhs (first) plus a sum of Rs 1,55 lakhs (second half) and or Rs 3,10 lakhs will be available for carrying out the drainage works

d) According to the letter of the Director of Public Health, a sum of Rs 21,06,126 will be required for the next three years for working out the remaining portion of the drainage scheme in Ghaziabad. Steps for orders as to whether this expenditure may not be met on equal proportions by the Govt & the M.C as hitherto proposed

Lucknow dated 14/6/45

(J. 962/5.)

3) The Govt may meet half of the amount of Rs 21,06,126 required during the next three years for completing the Scheme for the year 1945-46 the Govt will have to meet 1,55 lac the remainder by the

11/45-

Bangalore City Drainage Scheme 1882

Remaining 153 Lakhs

Edn P.W.

16 5 43

6927

OFFICE OF THE MINISTER FOR REVENUE & LAW
No. 216
Date 7 7 45

31) In the notes above, the cost of the entire work is taken at Rs 41 25 lakhs as per Government Order of 1941 Remembering that this Estimate was prepared in 1940, I do not think that the originally estimated figure still stands and that the balance required for completing the work is Rs 41 - 18 24 = 23 01 lakhs The working costs must have increased terribly and the actual outlay incurred could not therefore really represent half the cost of the work as one would imagine, nor would the balance of Rs 23 01 lakhs noted above be enough to complete the work

32) On pages 44 to 46 of the "Comprehensive Scheme of Underground Drainage for Bangalore City" placed in the file, the details for the estimate for Rs 41 25 lakhs are worked out It would be desirable to obtain a statement from the Drainage Engineer as to the present position of the several works referred to therein, i e , how many of these items have been taken up, the amount of estimate and the outlay to date and the balance required to complete the work with regard to those not taken up, what the cost is likely to be and under the present conditions If this information is obtained we would know then as to the expenditure which we and the Municipality should be prepared to finance if the work is to be completed

6927

33) I may however state that a sum of Rs 1 55 lakhs is provided in the State Budget for next year and a similar amount is stated to have been provided for by the Municipality, or in all Rs 3 10 lakhs By the time this outlay is worked the above information may be obtained and we could then prepare a programme for completion of these drainage works, ~~fully knowing~~ having full information what expenditure this involves

21/6

22-6-45

FC L S G & P H
Date 12 7 45
No 3314

34) The information may be obtained without any delay

25/7

35) Letter 25/7

36) Sended with a draft letter

25/7

The Director of P Health
L 914, d 10-8-45
Calls for the above information
Sended with a draft reminder

26/11

37) Some advice received

To Director of P Health
L 3425 D 1-11-45
Reminds
40) Reminded : What is the amount provided in the Municipal Budget for the works mentioned in the letter under reply

31 OCT 1945
SEC. & DEV SECTT

Sus A

Subj - Finances re Bangalore city Drainage

Continuation Sheet File No / Current No Scheme of Page

41) A grant of Rs 3,10,000/ has been allotted for the Bangalore city Underground Drainage Works, in the city Municipal Budget, for the year 1945-46, as detailed below —

Govt grant ——— Rs 1,55,000

Municipal Contribution - Rs 1,55,000-

Rw
12/11

Vide next page

23576

General and Revenue Secretariat | File No. | of 194 | [App F. III-2

Serial No

From the Director of Public Health
680-64/45-46 d 27-9-45
Fds for approval of the programme of work for the Bangalore City Drainage Division, during the current year

(2) The Director of Public Health has forwarded the programme of work relating to the City Drainage Division for the current year for Rs 2,50,000 for sanction of Government

(3) A provision of Rs 1,55 lakhs has been made in the State Budget for the year '1945-46,' under 'Bangalore city improvement — underground Drainage works."

(4) A similar provision of 1,55 lakhs has been allowed in the Budget of the Bangalore city Municipality, for the current year so all 'a' grant of 3 10 lakhs will be available for carrying out the underground Drainage works of the Bangalore City during the current year

(5) The Director of public Health has not furnished the information called for in this office letter no d 864 d 10-8-45 in connection with the financing of the City Drainage Scheme A draft reminder is put up

Vide Linked Fds

NOTE—Contn Sheet

Bangalore Drainage Scheme

File No of 194' | General and Revenue Secretariat

Serial No

(46) It is for orders if the programme of works for the current year, amounting to Rs 2,50,000/ may be approved, pending orders on the question of further financing the city Drainage Scheme

47) Pl resubmit after the issue of the reminder in the limited file for 30/11/46

The 26/10

48) The question of approving the programme of drainage works to be done in Bangalore city during 1945-46 depends upon the amount made available therefor by the Govt of the Mlty. A total sum of Rs 3,10,000 has been provided for the several works during the current year. The programme provides for only an expenditure of Rs 2,50,000/-

49) With a view to settling the future programme of works, some detailed information was called for from the Director of Public Health in August 1945 This has not yet been furnished in spite of two reminders. Moreover a proposal to transfer the drainage works in the city to the City Improvement Trust Board, Bangalore.

Flag V

Bangalore esp. drainage Scheme

In view of this fact a copy of this office letter, dated 10/8/15 will be sent to the Chairman Trustees Bangalore to furnish the information at once

5th) There is no doubt that in respect of the question already 4 months in the M year, are over it is necessary to utilize the provision made in this behalf since the amount asked for is Rs 12,50,000 for the drainage work is less than the previous made i.e. Rs 10,000, it is for order if the work may not be permitted to be proceeded with, so that time may not be made delay & the retardation in progress.

27/5
17/11

Reg. req. from 12/11/15

5) The Director of PH is generally slow in sending reports & sending information when asked for. At this rate, work will get stuck & this should be avoided at all costs. There is a proposal to transfer the Drainage Division to the Trust Board. Orders are separately under issue

5th) The Engineer officer stated at a meeting held in Carlton House, that he has made sure

2359/L

arrangements for incurring an Expd of not less than Rs 6,00,000/- during the remaining months of the official year it does not seem necessary to wait till the Municipality makes up its mind to place the necessary funds at our disposal. Work may be proceeded with on a trust basis.

5) for the present administrative sanction to a sum of Rs. 2,50,000 may be communicated for the City Drainage Scheme separate orders may issue for the balance required after obtaining detailed Estimates from the Trust Board.

Minister for Ed & P.H.)

Dsws
14/XI/45
14 11 45

4) 5

16/11/45

5)

Dewan

Through Secy

Dsws
16/XI/45
fmn

55) I do not follow the case at all The Bangalore City Drianage is a continous affair in that the work is continuing for the last several years and it is presumed that the Engineer in charge has a definite programme

for

programme regarding the work to be done & that the programme for the current year would have been drawn up long ago.

56) With regard to the question that the allotment may be placed at the disposal of the Engineer in charge, an allotment of Rs 3 lakhs has already been given If it is decided to speed up his programme, it is necessary to take stock of the work already done and the balance of work that has to be done and to prepare a programme for the rest of the work that has to be executed.

57) The Engineer officer attached to the Trust Board, Mr. was requested informally to furnish certain particulars about the programme of works for the year 1945-46 He said that although a comprehensive drainage scheme for it, good lakhs of rupees has generally been sanctioned, the programme of specific works to be carried out every year is being submitted to the Local Municipal Forests - Simla for this year, a programme for Rs 2,50,000 has been sent up provisionally the necessary approval to it

58) Actually ~~2.05~~ 3.10 lakhs
are being spent during the current year. The
increase of Rs 1.85 lakhs over the
like amount last year is mainly
the programme may be approved, so as to
enable him to start its work with regard to these

59) As regards the other items of work to
be taken up, the Engineer-in-chief stated
that detailed particulars have been prepared
would be submitted shortly. The works included
therein are said to be estimated at Rs 1.xx
lakhs. The receipt of information which answers to
these queries will be awaited

3485
3/12

60) In the meanwhile, the programme given
in statement (Flag K) may be approved
vide paras 55 & 56
above.

Financial Secy to Govt
3/12/45

Govt
4/12

61) When the grant is 3.10 lakhs what is
point in getting a programme for 2.5 lakhs
If only 2 lakhs were intended to be
spent why was a grant of 3.1 lakhs
asked for - We must insist on a
programme & provide funds after
reviewing the same & determining what
grant is necessary in the exigencies in a particular
year

B
for Govt

FINANCIAL SECTION
U.O.No. Fi. 3422
4/14 1945
BANGALORE

3971 J 2359/d

Serial No

From the Special Officer city Drainage Dn
9 7 d 5-12-45

Ref a copy of his letter dated 5-12-45 addressed to the Director of Public Health in regard to formation of the Bangalore city Drainage Scheme

(2) The Engineer officer has reported as follows —

Total amount of the Estimate	Rs 45,51,399
Less savings for House Connections	4,39,859
Balance amount	Rs 41,11,540
Outlay incurred	20,32,441
works to be done	17,03,822
Total	37,36,263
Net Savings	3,75,276

(3) He anticipates a net savings of Rs 3,75,276-

(4) After deleting the provision of ~~Rs~~ Rs 8 lakhs for the purification plant ~~where work~~ and after adding 50/ of Cost due to abnormal Conditions it is reported that a Sum of Rs 13,53,783 would be required to complete all the works and that the works would be completed with an excess of 18/ of the sanctioned estimate

(5) Refer - paras 31 to 34 of the Notes Supra

3911/5 23-9/1 5 4744

File No | of 194 | General and Revenue Secretariat

Serial No

66) Regarding the programme of works for the current year, a draft letter calling for a revised programme in accordance with the Financial Secretary's Note dated 6-12-45, is put up for orders

3954/12/12

67) For perusal please see

8/12

11/12/45

68) Yes Jones 12/12

69) Please see

13/12/45

The Chairman C & T Board vide L 5764 dt 13-12-45 calls for the revised programme from the Chairman C & T Board vide

TYPING SECTION 13 DEC 1945 GEN & REV SECTT

Pls see

Pls a copy of the Sanitary Officer's letter no 99 dated 5-12-45 addressed to the Director of Public Health furnishing certain information in regard to the Comprehensive Drainage Scheme

To be sent with a draft reminder to the Chairman calling for the revised programme

71) Please see

12/1/46

L 6764 16-1-46

TYPING SECTION 12 1 GEN & REV SECTT

3971/4996/2

General and Revenue Secretariat | File No | of 194 | [App F III-2

Serial No

From Chairman C.I.T. Board, A'bad
832 d 18-1-46

Fds a revised programme of works for the full grant of Rs 3,10,000- allotted for the City Drainage works during the current year (1945-46)

2) The Chairman has reported that all the items of work that included in the above revised programme would be taken up during the current year and every endeavour made to spend the entire amount

Refer Para 61 Supra

3) May be sent to the Fds, with speed

Para 61 supra

22/1/46

22/1/46

FINANCIAL ACCOUNTS BRANCH U.O.No. FI 4551 23-1-46

4) The revised programme may be approved

Seen Thanks
B.
24/1

5) What about the addl amount required by the Trust Board?

Contn Sheet

Revised programme of works for the Bangalore city Drainage Scheme 1946

File No of 194 | General and Revenue Secretariat

Serial No

76 Have Estimates been received?

Yes
25/1/46

as/1/46

77) The question relating to further financing the Bangalore city Drainage Scheme after 1-7-46 will be taken up separately after the programme of works for the current year is approved.

78) These works have been included in the Comprehensive Estimate for Rs 4½ lakhs sanctioned by Govt in Nov 1941

79) Individual estimates for the works ~~increased~~ included in the programme for the current year, have not yet been received.

80) The ~~re~~programme may be kindly approved, with the direction that the estimate for the work should be expedited one way need for Rs 2¾ lakhs (nearly) for laying drains in the Contemplated Malleswaram Extension as has been referred to this Office for sanction.

Receipt to be acknowledged

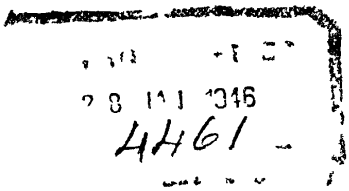
Yours faithfully

Sd/-

Programme of work for the Replacement of Drainage Scheme for 45-46

4496/1

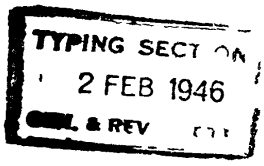
81) The revised programme may be offered if concurrence has been obtained
Vide para 74 Dewan
26/1/46



Dewan
29/1/46
Dewan
31/1/46

83) Draft for approval attached
Dewan
31/1/46

84) Issued with a draft D.O.



85) Issue attached
Dewan
1/2/46

To The Chairman C.G.T. Board Bihar
Controller
Chief Engineer Orissa
Lr 7843-M 149-45-42 dt 4-2-46

Herewith the revised programme of underground Drainage works for 1945-46 for Rs 3,10,000/

86) The Chairman, C.G.T. Board, Bihar will be requested to furnish a programme for completing the city Drainage works, taking into account the grants already allotted and the Savings

4486/2

mentioned by the Engineer Officer in his
report (vide para 33 supra)

87) The information referred to in para
32 supra may also be obtained
from
7/2/46

88) Submit with a draft letter

89) Done
8/2/46

To Chairman C.I.T. Bombay
L 6060 dt 11-2-46

Calls for programme for completion of
the works

from the Chairman C.I.T. Bombay

Letter No 1221 dated 6.3.46

Reports that the comprehensive scheme for the underground drainage in Bycula was sanctioned in Govt No L 3422-26 dtd 1.11.41 at an estimated cost of Rs 41 lakhs.

Submd
90) This was not the information required as per paras 32 & 88 supra

91) A draft letter is put up calling for the information as required vide letter no L 6060 dated 11.2.46

13/3

4986

9th) Submit with a draft letter, as instructed

93 J Murphy

2/4/46

To The Chairman C & T Board, Ashore

K 1036 of 6-4-46

Calls for further information

MAPPING SECTION
4 APR 1946
GEN & PEV SECTT

from the Chairman, C-&-T Board, Ashore

1649, dated 25-4-46

states that if sufficient money is provided and the entire programme appears well in advance all the remaining works relating to the city Drainage Scheme (except the installation of the purification plant) could be carried out during 1946-47 and recommends that a provision of Rs 3 of lakhs be made in the next years Budget, an equal sum being ordered to be contributed by the Municipality.

9th) The total cost of the remaining works relating to the city Drainage Scheme, (excluding the cost of the purification

75335 4946/2

plant) is estimated at Rs 6,15000/

95) The Chairman has suggested that a provision of Rs 3.08 lakhs be made in the next year's Budget an equal sum being ordered to be contributed by the Municipality

96) The Comptroller will have to be authorised to make a provision of Rs 3.08 lakhs in the Budget estimates for the year 1946-47 under "30 grants for public improvements — Poona City Improvement Trust Board

97) The Municipal Town will be requested to provide for a corresponding amount viz Rs 3.08 lakhs, in the next year's Budget of the Bangalore City Municipality

98) The Financial Dept has to be consulted

99) Refer para 61 below

100) All now, the provision made by the Govt towards their contribution for the City Drainage works already

was being included under
1 Blue cap supervisor - 30 posts for
Public Improvements - in the State
Budget

107) But the Special Drainage Division
has been transferred to the Bluecap
Improvement Trust Board, Constituted
during the current year and its transactions
& this Division are accounted for under
the Civil Improvement Fund Heads

"A" The provision to be made in its behalf
for the extent of Rs 3.08 lakhs during
1946-47 will have to be included
under the new Civil Improvement Trust
Head - 30 posts for Public Improvements -
to it as stated. But all the works
except the Precipitation Channels would
be completed next year. It is necessary
to make a grant by to Govt to the
extent of Rs 3.08 lakhs, as proposed
by the Chairman of the Trust Board

108 The Bluecap Board will be advised
to contribute an equal sum of Rs 3.08
lakhs. Government of their funds towards
these heads of expenditure. The posts may be continued

7264
1/5

3.08 lakhs will be
provided in the approved budget under
Civil Improvement Trust Board Bluecap
Heads

Financial Secretary

753 3/-

The proposal at A on the reverse concurred with by the Pl Reg might be attd hereto

3/5/46

Minute for Ed[n] Dept

3/5/46

I 3 5 46
no 6749

4/5/46

Pl may wish advice

7/5/46

Submit with draft letter to Comptroller

7/5

7/5/46

Dirl Com 4038 – Dirl Surg has agreed

[illegible]

15/5/-

15/5/-

Despatches

Please issue the letter at A to all Civil Hospitals & the Chairman of the Trust Board, Malta

16/5/46

To The Comptr
" Md Surg
" Chairman of Trust Board, Valle
L 12711 of 15-5-46

Requests him to make a recommendation as

7533/2

Rs 3 os lakhs in the State Budget for the
year 1948-49, a similar amount being
contributed by the Baroda City Municipality

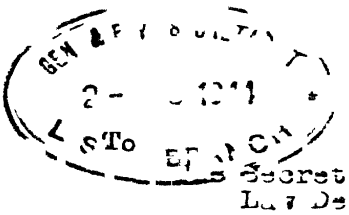
B

3768/L

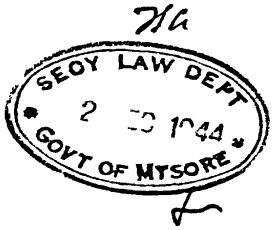
WD 05967—GPB—50 000—9-3-4

191 1-12-1944

From



To Secretary to Government,
Law Department, Bangalore



Dated 1st December 1944

Despatched

Received

General No C 81-1708
No

Enclosure No one

Sir,

Sub - Financing of the Bangalore City Drainage scheme.

In addition to Government Order No L 3433-36/41 90-11-4 dated 1st November 1941 sanctioning a comprehensive scheme for the underground drainage system of Bangalore City at a cost of Rs 41,24,441, I have the honour to state that a total contribution of Rs 10 lakhs has already been made by Government the Municipal Council, Bangalore City have contributed so far Rs 10,18,515 the outlay upto date is Rs 18,23,619 and the Special Officer reports that a sum of Rs 1,94,696 is available at present which will be utilised during the current year

While sanctioning the comprehensive drainage scheme Government observed that the question of financing the portion of the scheme will be considered after the year 1943-45

In his letter No 107 dated 16th November 1944, the Special Officer, Bangalore City, Drainage Division, Malleswaram has stated a total contribution of Rs 21,06,136 is required during the next three years so that the scheme may be completely worked out A copy of his letter is enclosed for the information of Government

I request you to be so good as to obtain and convey orders of Government in the matter

Copy of this letter is also sent to the Munic-
Commissioner, Cork for the City Municipality for the views
Council with regard to financing the remaining portion of the
scheme

I have the honour to be,
Sir,
Your most obedient servant,

Director of Public Health

Copy of the letter No 107 dated 14-11-1944 from the Special Officer, City Drainage Division, Bangalore

---

I have the honour to invite kind reference to Government Order No L 3422-26/ 1 90-41-4 dated 1-11-1941, sanctioning a comprehensive scheme for the underground drainage system for Bangalore City at a cost of Rs 41,24,441, and offering a grant of 3 lakhs of rupees during 41-42 in addition to 3½ lakhs of rupees that they had already granted Subsequently a further grant of Rs 3 lakhs was given by Government, making a total contribution of Rs 10 lakhs

The Municipality have so far contributed Rupees 10,18,315 The outlay upto date being Rs 18,23,619 the money available for the present is Rs 1,94,696, and will be utilised during the current year

The Municipal Commissioner's recommendation that the Government might be pleased to contribute half the cost of the estimate is not accepted by Government and they desired that the financing of the scheme should be considered after the year 1942-1943 As it is time enough now to do so I request you to kindly address the Government and the Municipality and obtain a total contribution of Rs 21,06,126 during the next three years, so that the scheme may be completely worked out

---

"Copy"

S. Ramaswamy

Director of Public Health

To, 27592

The Md Commr Bgs &c

30/1/45

Sir,

In inviting reference to the copy of letter No C81-1708 of 1-12-44 sent to you by the Director of P I+ for obtaining the opinion of the Bangalore Md el in regard to the ~~required to~~ ~~on~~ financing of the remaining portion of the comprehensive drainage scheme in Bangalore &c, I am directed to request you to forward the opinion of the Md el in the matter, very early.

I have etc

for

Secy to Govt

5750

BANGALORE CITY MUNICIPALITY.

No A1-1031/38

City Municipal Offices,
Bangalore, Dated 1st February 1945.

From:

K.Subba Rao Esq., B A ,
Municipal Commissioner,
City Municipal Council, BANGALORE

To:

C.Narayanaswamy Naidu,Esq , B A ,,B L
Legal Remembrancer and
Secretary to Government,
Law Department, BANGALORE

Sir,

With reference to your letter No.L 7592 dated 30-1-45 in the matter of furnishing the opinion of the Municipal Council in regard to the financing of the remaining portion of the comprehensive drainage scheme in the Bangalore City. I have the honour to state that the matter has been referred to the Council Their resolution in the matter will be communicated to Government in due course

I have the honour to be,
Sir,
Your most obedient servant,

MUNICIPAL COMMISSIONER

Subtd for perusal
further report will
be awaited
B.R.
Mar 13/2

Subd for perusal with
reference to para 9 of the
above letter

Law Secy
13/2/45

This must be expedited
Govt
14-2-45

A draft D.O letter to Secy
Mar 16/2

L-8321

Secretary
16/2/45

Govt Asst 22/2

21-2-45

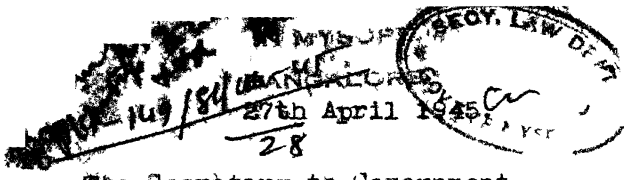
8321

Dear Sir, 21/2/45.

With reference to your letter No A1-1031/38 of 1-2-45 forwarding the drawings of the Bungalow and land in the possession of Mr. Chandrasekhara Iyer, I am directed to report you to expedite the transmission of the same.

Yours faithfully,

for Secretary (Typist)



27th April 1945

The Secretary to Government,
Law Department, Bangalore

Sir,

Sub: Further financing of the Bangalore city Drainage Scheme

I have the honour to invite kind reference to this office letter No C 81-1708 dated 1st December 1944 on the above subject and request you to be so good as to obtain and convey orders of Government in the matter The Special Officer in his letter No 232 dated 10th April 1945 intimates that as the financial year is in its last quarter further funds have to be provided for continuance of the work of the Division and that as the work in progress cannot be abruptly stopped at the close of the present financial year, early orders of Government may be communicated

I have the honour to be,
sir,
Your most obedient servant,

7148/L

DoN

Director of Public Health

DO

Poona Immediate

4/5/1945

Dear Sir,

I am desired to invite reference to this office letter NO L7592 dy 30-1-45 & the subsequent reminders thereto in regard to the financing of the remaining portion of the Comprehensive Drainage Scheme - Kirkee Poona & to request you to expedite the opinion of the Govt called for therein the matter may be kindly treated as immediate

Yours faithfully
for
3/5/1945

The Govt Commr,
Kirkee (By Poona name)

BANGALORE CITY MUNICIPALITY

No A1-1031/38

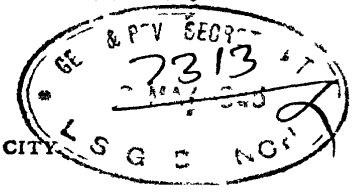
Encl one

MUNICIPAL OFFICES,

Bangalore 5th May 1945

FROM

K SUBBA RAO Esq B A,
MUNICIPAL COMMISSIONER
BANGALORE CITY.



To

C Narayanaswamy Naidu, Esq , B A , B L ,
Legal Remembrancer & Secretary to Govt ,
Law Department, BANGALORE

SIR,

With reference to your letter No L 7592 dated 30th January 1945, regarding the payment of the municipal quota of contribution for the underground drainage works in the Bangalore City, I have the honour to state that the Municipal Council have resolved at their meeting held on 23-4-1945, that an amount equal to the Government contribution might be paid annually as hitherto, necessary provision being made in the budget A copy of the Council resolution is herein enclosed.

I have the honour to be,
Sir,
Your most obedient servant,

K Subba Rao

Municipal Commissioner

Forwarded with compliments

A Gopalaswamy Iyengar
Hon President 5/5/1945

Proceedings of the Council Meeting dated 23-4-1945

Subject No 7 -

(Deferred subject 19/22-3-1945) Office note that the municipal quota of contribution for the underground drainage scheme may be equal to the Government - contribution as hitherto and it be paid annually

Resolution - Office note is approved

Sd M A Gopalaswamy Iyen ar,
Hon President

"Copy"

Municipal Commissioner

ksm

No L-964 10/8/41

To The Director of P Health in Mysore,
Bangalore

Subj — Financing of the Bangalore city Drainage Scheme

Sir,

With reference to your letter no 6 81-1708, dated 1-12-44, stating that a total contribution of Rs 21,06,126, would be received during the next three years to complete the Bangalore city Drainage Scheme ~~so that may be worked out completely~~, I am directed to observe that, the Government having regard to the present abnormal conditions, the Estimate amounting to Rs 41 25 lakhs for the work prepared in the year 1940, may require revision with reference to the actual working costs

In this connection I am to invite reference to pages 44 to 46 of the "Comprehensive Scheme of underground ~~of~~ Drainage for Bangalore city" prepared by Mr N Krishna Iyengar, Sanitary Engineer, where the details for the estimate for Rs 41 25 lakhs are worked out

I am to request you to forward a statement

Showing the present position of the several works referred to therein, i.e. how many of these shall have been taken up, the amount of estimate and the outlay to date and the balance required to complete the work with regard to those not taken up, what the cost is likely to be under the present conditions

The question may kindly be treated as urgent and a reply may be furnished without any delay

Yours truly
for Addl Secy

[redacted] PUBLIC HEALTH

[redacted]

[redacted]

GPB—50,000—9 34

25th September 1945

[redacted] tional Secretary to
Government, [redacted]

Programme of work for the [redacted]
[redacted] City Drainage Division for 1945-46

In continuation of this office letter No J 84-149 dated 28th April 1945 requesting orders of Government re, the further financing of [redacted] Drainage Scheme, I have the honour to enclose herewith for approval of Government, a programme of work for [redacted] City Drainage Division during the current year

I have the honour to be,
Sir,
Your most obedient servant,

[signature]

Director of Public Health

No L-3425 1st Nov 1945

Immediate

To

The Director of Public Health in Mysore

Bangalore

Subj:- Financing of the Bangalore City Drainage Scheme

Sir,

I am directed to invite reference to this office letter no L 964 dated 10-8-45 calling for certain information on the above subject and to request that a reply thereto may be kindly furnished immediately

Yours faithfully

for Secretary

WD 05967—GPB—50,000—9 3-42

194

From

The Special Officer, City Drainage Division, Bangalore.

To

The Director of Public Health in Mysore, Bangalore.

Dated 5/12/45

Despatched

Received

General No 97

No

Enclosure No. One statement

Sir,

Financing of the Bangalore City Drainage Scheme.

With reference to letter No.L-964 dated 10th August 1945 from the Additional Secretary to Government of His Highness the Maharaja of Mysore, I have the honour to enclose herewith a statement showing the sanction items, the outlay, the cost of remaining works to be done, the savings and the excess, relating to all the items mentioned in the sanctioned Comptehensive Scheme.

It is noted from the statement that the remaining works to be done amount to Rs.9,03,822/- excluding cost of purification plant namely 8 lakhs of rupees. For the present we are concerned only with the works other than the purification plant. Due to abnormal conditions, 50% of cost may be expected over Rs.9,03,822/- Which means a sum of Rs.13,53,733/- will be required to complete all the works. The amount available is actually Rs.12,79,098/- There will thus be an excess of Rs.76,635/- due to abnormal conditions. In other words, we may take it that all the works may be completed with an excess of 1.8 per cent of the sanctioned estimate.

I have etc,

Sd/- Y Ramaswami,

Special Officer,
City Drainage Division.

MR/4-12.

P.T.O

111

Statement showing excess amount required to complete the Sch

		Rs
Total amount of the estimate		45,51,399
Less savings for house connections		4,39,859
Balance amount		41,11,540
Less outlay + balance to be done.-		
outlay	20,32,441	
works to be done	17,03,822	
Total	37,36,263	3736,263
Net savings		3,75,276
Total cost of works under progress + works to be taken up		17,03,822
Less amount of the estimate for the disposal works which is not to be taken up now		8,00,000
Balance to be worked out		9,03,822
Add 50% over this according to the present market conditions		4,51,911
Total required		13,55,733
Amount available in the estimate		12,79,099
	9,03,822	
savings	3,75,276	
	12,79,099	
Excess required over the estimated rates		76,635

Sd/- Y Ramaswami,

Special Officer,
City Drainage Division.

No 226 Dated, 5/12/45

Copy of the above is forwarded to the Secretary to Government, Revenue Department, Bangalore for favour of information

Y Ramaswamy
Special Officer,
City Drainage Division

L 5169 - 13-12-45 1 Copy

G R S App F G 3

GENERAL AND REVENUE SECRETARIAT

(*Continuation sheet draft form*)

To

The Chairman C.D.T. Board

Bangalore

Programme of work for the Bangalore city Drainage Division for the year 1945-46.

Sir,

In reference to the above programme of works received from the Director of Public Health in Mysore with his letter No C-80-69 dated 29-9-45 I am directed to observe that a grant of Rs 3 10 lakhs has been allotted for the city Drainage works during the current year as noted in the margin But the present programme has been drawn up for a sum of Rs 2 5 lakhs only

I am to request you to forward a revised programme of the works for the full

Your grant - Rs 1,55,000
Municipal
Contribution - Rs 1,55,000

D 0565—GPB—22 500—8 11 38

grant of ₹ 10 lakhs allotted
for the works during the
current year

The items of the works taken up
during the current year & their estimated
expenditure are as follows

The works will be
executed by
the Revenue Secretary

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE

TRUST BOARD,

No L 5169

General and Revenue Secretariat

Dated, Bangalore, 13 12 1945 — 16

FROM

The Secretary to the Government of His Highness the Maharaja of Mysore
Revenue Department.

To

ore

The Chairman,
City Improvement Trust Board,
Bangalore

Sir,

Programme of works for the Bangalore City Drainage Division for the year 1945-46

In returning herewith the above programme of works received from the Director of Public Health in Mysore with his letter No C 80-69/45-46 dated 29th September 1945, I am directed to observe that a grant of Rs 3 10 lakhs has been allotted for the City Drainage works, during the current year, as noted in the margin. But the present programme has been drawn up for a sum of Rs 2.5 lakhs only I am to request you to forward a revised programme of the works for the full grant of Rs 3 10 lakhs allotted for the works during the current year The items of work that would be taken up during the current year and their estimated expenditure may be kindly intimated by return of post.

Government Grant	Rs 1,55,000
Municipal Contribution	Rs 1,55,000

I have the honour to be,
Sir,
Your most obedient servant,

Ramachandra

Ecka

for Secretary to Government,
Revenue Department

tvr 2

C F No 45]

Tele gram / phone

No 793
Encls Two

GOVERNMENT OF MYSORE

4746

OFFICE OF
THE CITY IMPROVEMENT TRUST BOARD,
-BANGALORE.

Date January 11, 1946.

To

J.B MALLARADHYA, Esq , M.A.,
Secretary to the Government of Mysore,
Revenue Department, Bangalore.

Sir

With reference to your letter No L.964, dated the 10th August 1945 and subsequent reminders thereto addressed to the Director of Public Health in Mysore, Bangalore asking for certain information on the above subject, I have the honour to forward herewith a copy* of letter No 97 dated the 5th December 1945 from the Special Officer, City Drainage Division addressed to the Director of Public Health in Mysore furnishing a statement showing the sanctioned items of work, the outlay, the cost of remaining works to be done, etc , relating to several items of work in the sanctioned comprehensive scheme

I have the honour to be,
Sir,
Your most obedient servant,

Y Ramswamy
For Chairman, 11/46
(Absent on casual leave)

*Enclosed

LETTER NO 97, dated the 5th December 1945, from the Special Officer, City Drainage Division, Bangalore, to the Director of Public Health in Mysore, Bangalore.

Financing of the Ban alore City Drainage Scheme

With reference to letter No L 964 dated 10th August 1945, from the Additional Secretary to Government of His Highness the Maharaja of Mysore, I have the honour to enclose herewith a* statement showing the sanctioned items, the outlay, the cost of remaining works to be done, the savings and the excess, relating to all the items mentioned in the sanctioned Comprehensive Scheme

It is noted from the statement that the remaining works to be done amount to Rs 9,03,822 excluding cost of purification plant namely 8 lakhs of rupees For the present we are concerned only with the works other than the purification plant Due to abnormal conditions, 50% of cost may be expected over Rs 9,03,822 which means a sum of Rs.13,53,733 will be required to complete all the works The amount available is actually Rs 12,79,098 There will thus be an excess of Rs 76,635/- due to abnormal conditions In other words, we may take it that all the works may be completed with an excess of 1 8 per cent of the sanctioned estimate

---

* Statement showing excess amount required to complete the Scheme

Total amount of the Estimate		Rs 45,51,399
Less savings for house connections		4,39,859
	Balance amount	41,11,540
Less outlay + balance to be done -		
Outlay	20,32,441	
Works to be done	17,03,822	
Total	37,36,268	37,36,263
	Net savings	3,75,276
Total cost of works under progress + works to be taken up		17,03,822
Less amount of the estimate for the disposal works which is not to be taken up now		8,00,000
Balance to be worked out		9,03,822
Add 50% over this according to the present market conditions		4,51,911
Total required		13,55,733
Amount available in the estimate		12,79,099
9,03,822		
savings 3,75,276		******
12,79,099		
Excess required over the estimated rates		76,635

'Copy'

For Chairman

	9,03,822	
savings	3,75,276	
	12,79,099	
Excess required over the estimated rates		76,635

"COPY"

FOR CHAIRMAN,
CITY IMPROVEMENT TRUST BOARD

4784

Immediate 16-1-46

To The Chairman, c/o T. Board.

Bangalore

Subj - Bangalore City Drainage Scheme

Sir,

With reference to the correspondence ending with your letter No 793 dated 11-1-45, on the above subject, I am directed to request you to kindly ~~for~~ forward immediately, the revised programme of the works for the full grant of 3 lakhs ~~lakhs~~ allotted for the works during the current year, as called for in this office letter No L5169 dated 13-12-45.

Yours faithfully

for Revenue Secy.

RY 149-45-41

WD 05967—GPB—50,000—9-42

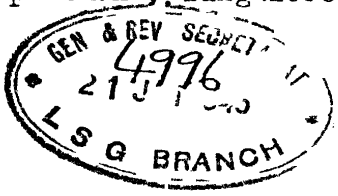
194

From

The Chairman,
City Improvement Trust Board,
Bangalore

To

The Secretary to Government,
Revenue Department, Bangalore



Dated

Despatched

Received

General No 832/18/46
No

Enclosure No.

Sir,

Revised programme of work for the Bangalore City Drainage Division for the year 1945-46

As desired in your letter No 5161/k dated 13-12-45, I have the honour to forward herewith a revised programme of works for the full grant of Rs 3,10,000/- allotted for the City Drainage works during the current year All the items of work that are programmed for the year would be taken up during the year Every endeavour will be made to spend the entire amount before the close of the official year

I have the honour to be,
Sir,
Your most obedient servant,

Chairman,
C I Trust Board

P T O

Revised programme of underground Drainage works proposed to be taken up during the year 1945-46.

1.	Main Ovoid Sewer	Rs 1,00,000
2.	Duplicating the Malleswaram Main	15,000
3	Eastern portion of Malleswaram Estimate Rs. 3,65,000/-	1,00,000
4	Extension of the Malleswaram outfall Est Rs 1,15,000/-	50,000
5.	Munireddypalayam - Est 35,000/- --	20,000
6.	Linking Sampangi Tank with the Main (Est. Rs. 13,000/-)	13,000
7.	Street sewers in High ground area - Est Rs. 10.000/-	10,000
8.	Final bills and other Miscellaneous works	2,000
		3,10,000

Chairman,
City Improvement Trust Board

for Revenue Secy

G R S App F VI—G 2]

SUBJECT

Diary No of letter replied to

General and Revenue Secretariat

( )

the *194*

Date of issue 4 2 46 194

Signed by M S R Rao

May this be—

(i) printed ?

(ii) treated as a Standing Order ?

(iii) published in the Gazette English Part ?

(iv) translated ?

(v) placed at the disposal of the Press ?

(iv) published in the Gazette Kannada Part ?

Section M

File No 149-45

Serial No 42

Proceedings of the Government of His Highness the Maharaja of Mysore

Read—Correspondence ending with letter No. 832, dated 18-1-46, from the Chairman, C.D.T. Board, Bangalore forwarding for sanction a revised programme of works relating to the Bangalore city Drainage Division for the year 1945-46 for the grant of Rs 3,10,000/ allotted for the works

~~Order thereon—No.~~

Order No L7843-8 dt 4. 2. 46

Sanction is accorded to the revised programme of underground Drainage works proposed to be taken up during

In Bhimavaram

the year 1945-46, an
estimated cost of Rs 3,10,000,
as shown in the statement
appended

T/S

p1 Type
C Reverse of
Yly T

The estimates for the works
included in the programme should
be submitted to Govt early for
sanction

Yours
Jas Reveley

To The Chairman C & T Board ✓
Bhimavaram
" Municipal Commissioner ✓
" Comptroller ✓
" Director of Public Health ✓
" Chief Engr for Irrign ✓
" " for Roads ✓
Buildings

List of Enclosures

Copied by

Examined by

PROCEEDINGS OF THE GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE

R E A D:

Correspondence ending with letter No.83?, dated the 18th January 194?, from the Chairman, City Improvement Trust Board, Bangalore, forwarding for sanction a revised programme of works relating to the Bangalore City Drainage Division for the year 194?-4?, for the full grant of Rs.3,10,000/- allotted for the works.

O R D E R NO: L.7843-8/M 144-45-42

Dated, Bangalore, the 4 February 1945.

Sanction is accorded to the revised programme of Underground Drainage works proposed to be taken up during the year 1945-47, in Bangalore City, at an estimated cost of Rs.3,10,000/- as shown in the statement appended.

The estimates for the works included in the programme should be submitted to Government early, for sanction.

By Order,
Secretary to Government,
Revenue Department.

Copy To

The Chairman, City Improvement Trust Board, Bangalore,
The Municipal Commissioner, Bangalore City,
The Comptroller to Government,
The Director of Public Health in Mysore,
The Chief Engineer for Irrigation in Mysore,
The Chief Engineer for Roads and Buildings in Mysore,

DH/E

sed programme of underground Drainage works proposed to be taken up during the year 1945-46

1. Main Ovoid Sewer.	. .	Rs.1,00,000
2. Duplicating the Malleswaram Main.	...	15,000
3. Eastern portion of Malleswaram Estimate Rs.3,65,000/-	..	1,00,000
4. Extension of the Malleswaram outfall Est. Rs.1,15,000/-	.	50,000
5. Munireddypalayam - Est. Rs.35,000/-	.	20,000
6. Linking Sampangi Tank with the Main (Est. Rs.13,000/-).	. .	13,000
7. Street sewers in High ground area - Est. Rs.10,000/-.		10,000
8. Final bills and other Miscellaneous works.		2,000
		Rs.3,10,000

for Secretary to Government,
Revenue Department.

BKP/2

L 8060
11 2 46

To

The Chairman, C S T Board
Bangalore

Subj - Financing the Bangalore city Drainage Scheme

Sir, with reference to the correspondence ending with your no L 7843-8/M 149-45-42 dated 4-2-46, approving the revised programme of works for the year 1945-46, I am directed to state that the question of further financing the Scheme so as to complete it has to be decided.

In this connection I am to request you to forward a programme for completion of the remaining portions of the city Drainage works, with full information as to what expenditure has to be incurred each year if available only by end of June, 1946 against the current years grant

Total outlay to be incurred on the
till the end of the current year, has
to depend on the present conditions and
anticipated savings.

An early reply is requested.

I have the
honour to be
Sir
Your most obedient
humble servant

CF No 461

GOVERNMENT OF MYSORE

No 1 [illegible] OFFICE OF THE CITY IMPROVEMENT TRUST BOARD

Encls 1 'Bangavilas', Seshadri Road, Bangalore

GEN & REV SECTT 6290 11 MAR 1946 2 L S G BRANCH

Date March 8, 1946.

To

J. B. MAILARADHYA, Esq., M A ,
Secretary to the Government
of Mysore, Revenue Department,
Bangalore

Sir

4996 Secs

Adverting to G O No L 7843-8/M1 149-45-42, dated the 4th February 1946, sanctioning the revised programme of underground drainage works proposed to be taken up during the year 1945-46, at an estimated cost of Rs 3,10,000/-, and asking for the estimates for the works included in the programme, I have the honour to state that estimates for works referred to in the programme have been sanctioned by Government when the comprehensive scheme for the underground drainage in the Bangalore City, at an estimated cost of Rs 41,24,441 was sanctioned in G O No L 3422-26/M1 90-41-4, dated the 1st November 1941

I have the honour to be,
Sir,
Your most obedient servant,

CHAIRMAN,
City Improvement Trust Board,
Bangalore

YBR

L. 10367

6/4/66

To The Chairman, C & T Board

Bangalore

Subject Bangalore City Drainage Scheme

Sir

With reference to the correspondence ending with your letter No 1221 dated 8-3-66, on the above subject, I am directed to request you to furnish the following information -

1) Out of the several items of works included relating to the City Drainage included in the statement received with

Your letter no 793 dated 14-1-46, how many of them would be licensed during the official year 1946-47, and what would their estimated cost ~~would be~~

2) The period to which the Govt will have to finance the scheme during the next year, and the actual provision required to be made in the next years State Budget for the purpose

The information called for, in this office letter No. L 5060, dated 11-2-46, be given the financing of the scheme so as to complete it may be kindly furnished early

Yours faithfully
for Revenue

FD 114 9-45-75

27 APR 1946 G G BRANCH

No. 1649

THE CITY IMPROVEMENT TRUST BOARD,
'Ranga Vilas', Seshadri Road,
Bangalore, dated 25th April 1946

To

J.B MALLARADHYA, Esq , M A ,
Secretary to the Government of Mysore,
Revenue Department, Bangalore

Sir,

Subject Bangalore City Drainage Scheme

With reference to your letter No L 10367 dated the 6th April 1946 enquiring how many items of the Drainage Scheme will be taken up for execution during 1946-47 and at what cost, I have the honour to state that several works have been under progress for more than one year and most of them will have to be continued as part of the programme for the year 1946-47 also It ~~is~~, therefore, appears more convenient to specify the works that remain to be done and the amounts required to complete them If sufficient money is provided and the entire programme approved well in advance, all the remaining works, except the installation of the purification plant estimated at Rs 8 lakhs, can be carried out during 1946-47.

According to the present practice some months are lost in getting the programme approved and some more in calling for tenders and getting them accepted by Government If these preliminaries can be completed before the first of July 1946, the Board will have full twelve months available for execution of the works If this idea commends itself to Government then the amount required during the next official year, as per sanctioned estimate will be Rs.6 15 lakhs as per details furnished below -

1	Main Ovoid Sewer Part I	Rs 30,000
2	Malleswaram Main	15,000
3	Eastern portion of Malleswaram	2,00,000
4	Munireddypalya	35,000
5	Malleswaram outfall	1,15,000
6	Undeveloped areas	1,77,971
7	Sampangi Tank Link	13,000
8	High Ground	10,000
9	Public Conveniences	15,000
10	Portions worked out under L S provisions	4,000
	Total	6,14,971 or 6,15,000/-

With the execution of works specified above, all the works included in the sanctioned Drainage Scheme will have been completed excepting the installation of the Purification plant It is therefore suggested that Rs 3 08 lakhs may be provided in the Budget for the next official year and that equal sum ordered to be contributed by the Municipality.

I have the honour to be,
Sir,
Your most obedient servant,

CHAIRMAN,
City Improvement Trust Board,
Bangalore.

YBR 2

L 12711/FL 149-45 76 ✓

S. 46. Immediate

16

To

The Comptroller to Govt

(Through the Financial Secy)

Subj – Bangalore City Drainage Scheme

Sir,

I am directed to request that a sum of Rs 3·08 lakhs, for the Bangalore City Drainage works, may be kindly provided under the head 11 Bangalore City Improvement Trust Board – 30 grants for Public Improvements in the State Budget for the year 1946-47

The Municipal Council Bangalore City has requested to contribute an equal sum of Rs 3·08 lakhs, from out of Municipal funds, towards their share

of Expenditure during next year, with a view to facilitate the completion of the Scheme

I have the honour

Memo no 1/12712-3 Sir Revenue Secy
dt 15.5.46

Copy w.c. to the Chairman, C.W.T. Board, Barisal for info, with reference to his letter no 16499 dt 25-4-46

Copy w.c. to the Municipal Comr, Barisal City Chairman (the President) for info & necessary action.

By order

Sir Revenue Secy

COMPREHENSIVE SCHEME

OF

UNDERGROUND DRAINAGE FOR BANGALORE CITY

BANGALORE
PRINTED BY THE SUPERINTENDENT AT THE GOVERNMENT PRESS
1940

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I

NOTE ON THE PRESENT POSITION OF THE BANGALORE CITY SEWERAGE

The laying of the main sewerage has progressed so far and at present has almost reached the terminal near the Old Septic tanks at the Sunkal Farm Side by side with the main, sub mains have been laid in Arlepet and Chickpet areas and house connections are being given slowly Other areas such as portions of Malleswaram, Basavangudi, Chamrajpet, Visveswarapuram extensions and some parts of the City have also been provided in bits with sewers in a way, from time to time Time has now arrived when a quick decision has to be taken in respect of disposal works and other matters

In regard to these there are found in the records, notes left by Mr J E A D Cruz who prepared the project and by Messrs John Bhore and H F Marker along with the opinion of Sir M Visveswariah on these notes

The points first requiring settlement are about the outfalls To state briefly, Mr D Cruz has suggested the main outfall being located at the Sunkal Farm, diverting a major portion of the sewage of the City and having recourse to pumping from lower districts to the main where practicable He has also advocated independent land treatment for sewage of the areas that cannot be connected to the main outfall at Sunkal Farm

Dealing with the subject of pumping of sewage from the lower districts to the main line, the following facts are brought to notice —

Outfall

Mr D Cruz has recommended the installation of Shone s Ejectors in preference to pumps, as being simpler, cheaper and not requiring much atttention

The then Chief Engineer, in his Note dated 17th March 1919 has remarked as follows in regard to Ejectors —

"The efficiency of these is doubtful and it seems desirable to study their working in Bombay and other cities where they are in use, before adopting the proposal

Again in a note furnished by the same officer on 24th June 1919 he has stated as follows —

"But, as has already been pointed out by me, this portion of the work may very well be deferred for the present, pending further investigation in the matter

Mr Bhore s observation is as stated below —

"The conditions are not similar to those of Rangoon Bombay or Karachi and I venture to say, that in no locality such as ours with a number of small stations with different lifts, have Shone s Ejectors been used Even in Bombay, it is admitted that this system is not a success It is neither economical nor efficient If pumping is *necessary* with cheap electric power available, I think it would be more satisfactory to have motors and suitable pumps I would hestitate to go in for Snone s Ejectors

Mr H F Marker has not left any definite opinion about this beyond stating that the Municipalities of Bombay, Karachi and Rangoon may be consulted and their opinion taken as to their working and their suitability before they are finally adopted

On this question, Sir M Visveswariah s opinion is "I agree with Mr Bhore that the use of Shone s Ejectors is not necessary in this case

The following remarks about the Ejectors system are set forth for consideration —

'While this system has the apparent advantages of being automatic and of not requiring that the sewage be screened, it is found in practice, that considerable attention is required to keep the apparatus in good working order While it has not been found necessary to screen the sewage thus avoiding the production of unpleasant conditions in the neighbourhood, there has occasionally been some trouble due to sticks and other obstructions lodging under the valve When this happens, the Ejector is filled and emptied in quick succession, the sewage in the force main passing back through the check valve into the Ejector This, of course, results in the use of large quantities of air and if the valve is open so that the back flow is large, the air may be so drawn that the station cannot maintain the necessary pressure and all the Ejectors in the system are thrown out of use

More recently Mr N V Modak, the City Engineer of Bombay, in a paper contributed by him to the '*Young Engineer*' a Karachi Engineering College Magazine, in October 1935, has recounted the troubles experienced by the Shone s system at Bombay with the consequent accumulation of sewage in these stations and how it was at one time, thought of reverting to the gravity system completely, but was given up for financial reasons

Having stated so much about the Ejectors, it will be useful to consider the question of pumping In this connection, the opinion of the gentlemen mentioned above are noted for reference

Mr Bhore s opinion is as follows —

"A pumping scheme is always more expensive than a gravitation scheme, both in its original cost and also in its recurring maintenance charges Therefore, unless there are very good reasons to have a pumping scheme, a gravity scheme is the best, it is not only more economical, but less troublesome to maintain I have not been able to get the details of the proposals to be adopted at the various pumping stations, but if provision is not made for storing sewage, during possible breakdown, there will be serious trouble A pumping scheme requires very great care and it is very costly to maintain Therefore, unless we are absolutely obliged to resort to this method of dealing with the city sewage, we should not adopt it, and it should be resorted to only if a gravity scheme is not possible

Mr H F Marker gives the following opinion —

"A pumping scheme is costly both in its original cost and its recurring maintenance charges But if the sewage is allowed to gravitate in its natural valleys and treated on land on the outskirts of several outfalls, the scheme becomes more simple, and less complicated less costly in ts intial expenses and in its maintenance and more easy for the Municipality to look after, than with a number of Ejector stations and air compressing plant But no doubt, it will not be an ideal thing For compactness of the scheme and from a health point of view, one common outfall is the best Several outfalls scattered round about the City are likely to be neglected than one common outfall etc'

Sir M Visveswaraiah has stated that "to provide one common outfall for the entire sewage from every part of the City would be an ideal arrangement, but as it will necessitate much pumping, it would be costly to do this It is understood the Municipality is not financially in a position to carry out works which are not absolutely necessary Gravitation outfalls already exist for Malleswaram, Chamarajpet, and Basavangudi and these may continue to be used for the present, but the sewage in Arlepet which has no common outfall at present, may be collected and pumped into a sewer within the drainage area leading to the Sunkal tank'

The following general remarks are submitted for consideration in regard to this question of pumping sewage —

"The equipment of pumping stations must be selected with a view to meeting the usual working conditions in the most economical manner which the funds permit In the selection of pumping plants for sewerage work, the primary consideration should be reliability of service This means not only sturdy construction, but also in the case of electrically operated pumps, reliability of source of current In estimating costs it is desirable to obtain actual

operating costs from places using plants like those under consideration It is inevitable for manufacturers to state the steam on current consumption of their pumps as small as they consider it safe to place them while the Engineer must be more liberal If the capacity of a plant is made close to the actual needs and then it is brought under a guarantee of performance, any failure to equal that performance can rarely be made good by a deduction from the contract price, the plant will not perform its service as it should, thus perhaps throttling the sewer system and the Engineer has failed to properly safeguard his client This is particularly important in connection with centrifugal pumps, for experience has shown many times that their capacity has not equalled that contemplated in the plans"

'The Engineer must also be very cautious about using the information regarding the cost of sewage pumping given in annual municipal reports, for very often the pumpage is actually unknown and the quantity reported merely a guess'

"In most sewage pumping stations, there is provision for some storage of the sewage, in order to equalise the fluctuations in the rate of flow through the sewers sufficiently to enable the pumps to work properly In a few cases, this storage is extremely limited and it would be impossible for the pumps to run except for a few minutes at a time, were it not for unusual steadiness in the rate of flow to the stations, something which the designing Engineer should be very slow to place any reliance upon

The storage basins in connection with sewage pumping stations are usually small wells where, with the separate system the amount of storage required is small and the flow must be retained for varying periods in order to provide a proper load for the pumps So far as our scheme is concerned, two such pumping stations are contemplated, the one for pumping the sewage from the Malleswaram, Sri Rampur and Seshadripuram areas and the other from part of the Basavangudi extension The Malleswaram extension had a small outfall at the junction of the first main road and the link road to Seshadripuram and it is now removed

The sewerage lines already laid in this extension are found to be defective. The lines seem to have been laid in bits from time to time and this has caused variations in levels Some portions have been choked up while others are broken and the whole area has now to be resurveyed and if found necessary, the lines are to be relaid to make them really a part of the City s comprehensive scheme

Again, all the outlets of the dwellings are not connected to the sewers and consequently, it is common sight that there is considerable sewage flowing in the surface drains almost everywhere In some places, the line is quite dry and not a drop of sullage is found In others, on account of chokage the lines are broken and the sullage allowed to flow outside

Almost similar may be the conditions in that part of Basavangudi where pumping is proposed, the result is that it is difficult to ascertain what is the quantity of sullage that has to be dealt with ordinarily by the pumps, whether it is a fluctuating quantity and if so, its range

Under such circumstances, it will not be possible to furnish any definite data required for drawing out the necessary specifications for the proper design of the pumps to be ordered unless it be, that the pumps have to be made to deal roughly with a quantity equivalent to the pipe drain discharging half full

To deal with this sewage water, containing several varieties of suspended and floating matter, special sewage pumps have to be in duplicate so that one may be a standby These pumps are not easily available and even where they are made, they have to be specially manufactured to suit our specifications In the event of pumping being decided upon, it is also necessary to have some spare parts ordered in advance One other difficulty in this respect is the contingency that when current fails for an unusually long period at any time, the accumulation of sewage will be too large causing considerable nuisance

The foregoing remarks in connection with sewage pumping are mentioned in some detail, so that the points involved may be clearly presented in order to arrive at a decision whether pumping has to be resorted to, or in the alternative, the sullage of each area may be allowed to gravitate to the valley nearest to it, and treated at some distance from the City Regarding the second alternative, Mr Bhore s observations are quite clear and convincing and the undersigned has no hesitation in stating that considering all our conditions, and circumstances,

Mr Bhore's recommendation still holds good even now and is worthy of full consideration

The next point requiring to be settled is about the final treatment of the Sunkal outfall

Treatment and Disposal of Sewage

From the point of view of the City requirements, the disposal works are proposed to be located near the existing septic tanks at the head of the Sunkal valley But it was considered advantageous and economical for both the City and Cantonment (part) to have a common outfall In consultation with the officers concerned with Cantonment, a joint inspection of the most suitable site for both the towns was made by the Chief Engineer, the Director of Public Health, the President of the Civil and Military Station Municipality, the Sanitary Engineer and the Municipal Engineer, Cantonment Municipality The site thus selected is about 2½ miles away from the proposed present terminus of the City drainage

A note on the financial aspects of the combined as well as separate disposal arrangements, was handed over to the Municipal Engineer, Civil and Military Station, for consultation with the President and furnishing their final views to enable the question being pursued There has been no reply so far and in the meantime it is ascertained that the personnel of the Engineer of the Civil and and Military Station Municipality has changed

However, the note deserves to be considered by the Committee before the question is again taken up and pursued with these officers

Three methods of treatment are dealt with in the report and their financial implications foreshadowed These are (1) The Simplex, (2) The Activated Sludge and (3) The Chemical Treatment For the first method, the capital cost for the City and Cantonment units separately, has been roughly estimated at five lakhs and two lakhs respectively, while the cost for the combined unit is worked out to be six lakhs The recurring charges are Rs 20,000, Rs 10,000 and Rs 25,000 respectively for the City and Cantonment separately, and for the combined unit For the second or Activated Sludge process, the corresponding figures for the capital are 6 lakhs, 3 3 lakhs and 7 lakhs and Rs 60,000, Rs 30 000 and Rs 80,000 for maintenance Similarly, the figures for the last or chemical treatment are 5 lakhs, 2 lakhs, and 5 5 lakhs for capital expenditure and Rs 60,000, Rs 17,500 and Rs 77,500 for maintenance The establishment charges are separate and estimated at Rs 8,500 a year Besides these figures, the additional expenditure to the City for extending the line by a length extra 2½ miles to the common point of treatment will amount to a further sum of four lakhs of rupees

In apportioning both the capital and recurring expenditure, it is assumed that each will bear 50 per cent Though there is not any great variation in the capital cost, the recurring expenditure is stated to be the least in the first of the three methods

The first method of treatment seems to be just being installed at Bombay and the second is under operation at Jamshedpur The experience in these two places seems to be of far too short a duration to be of any definite value to us under our conditions The third or chemical treatment does not seem to have been taken up anywhere in India except as a matter of experiment The recent experiments made indicate the possibility of adopting this system in Mysore and Bangalore especially in view of the fact that the chemicals required may be had at Bhadravati and as regards the cost of maintenance from actual experience, it is stated that it will be very much less than what has been stated in the note sent to Cantonment From the details worked out roughly to deal with the quantity of sewage by this method for Bangalore City sewage, the cost will be about two lakhs of rupees including all structural details

In this connection, the following remarks from the proceedings of the Annual Meeting of the American Sanitary Engineering Division held on 7th January 1935, will be found to be interesting

"A generation ago, the chemical treatment of sewage passed from favour because of the high cost of the chemicals required and the development of the cheaper biological method The latter, however, required a large and isolated area for its facilities As Cities grow in extent and density, proper sites are often difficult to find, and it becomes desirable to locate a plant in a public park, as was done at Dearborn (Mich) or in an exclusive residential area as at Birmingham (Ala ,

Then too, chemicals are now more reasonable in cost, and the growing volumes of trade wastes make it advantageous to employ a method less easily upset by intermittent concentration of such wastes than is the delicately balanced Activated Sludge Process

"Current experience in Alabama Michigan and California seems to indicate that chemical precipitations may be used economically to supplement primary treatment or, as at Painfield (N J) to assist secondary biological treatment Further economy results from the possibility of stopping the application of the chemicals entirely or of adjusting the amount according to the ability of the stream to handle the effluent The chemical dosage is easily increased coincident with the daily or seasonal arrival of concentrated sewage or it may be discontinued entirely during periods when the sewage is weak

The Director of Public Health informs that the Singapore Municipality have experimented upon a bio aeration method in place of activated Sludge Plant as the latter plant is very expensive—both the initial and recurring costs—to suit the characters of practical sewage, and that the Municipality have decided to adopt it for their future treatment and the works have been approved by the experts in England

The design and treatment

The design and the plans have been written for and they are awaited. The Director says the main principle on which this plant works is on the same principle as the ones that are used in Sheffield

While on this subject of final treatment of sewage the following points are brought to notice for consideration —

House Connections and Utilization of Municipal Funds

The question of house connections has not been seriously considered either here or even at Mysore While the method of final treatment at the outfall is being cogitated upon for some time past, not much thought seems to have been bestowed upon this subject One of the main objects in treating the sewer at the outfall is to render the pathogenic germs innoccuous and the effluent odourless. Whether this object is achieved at all, when so many of the dwelling houses in the City are left unconnected to the sewers has to be considered Many of them with a number of outlets are given one or two connections at the utmost or none at all, with the result that a good portion of the sewage is practically drained away from the sewer in surface drains and the quantity reaching this outfall is thus considerably reduced The existence of daily conservable latrines with the out of date trap doors allowing filth and excreta to soak into the ground on either side of a finally built substantial house with up to date sanitary fittings, is a very common sight It is here, if anywhere, that causes of disease have to be battled against and removed and not at the outfall in the first instance As the question is bristling with difficulties, it is being allowed to drift without any definite attempt being made to solve it It has to be tackled seriously now or never

The main points are the following —

Some houses have their outlets in different places, but they can be all combined into one outlet by proper disposition of the internal drainage, and finally one connection may be given In such instances, those who can afford the expenditure involved will readily consent to have the connections made at their cost, others who could see the advantage of such an arrangement are precluded from doing so for want of ready cash, but will gladly avail of any convenient arrangement of cash advance and repayment in instalments, while there are the absolutely poor who can ill afford the expenses to any extent and in their cases either the works have to be done free or their outlets left unconnected

There are other dwellings especially in the older parts of the city with tenants where a number of outlets are necessary and they cannot be combined into one internal drainage In such cases and in those of single tenements where, the kitchen, bathroom and lavatory are located in different places not easy of combination, separate connections are perforce necessary and here again the question of financial ability of the owner comes into play In all these cases it will be necessary for the Municipality to take full powers to compel houses to convert the outlets and to be used in the case of recalcitrants

The present position is, that though several outlets of the houses in sewers areas are being connected to the undeground sewers either by the house owners themselves or under compulsion from the local authorities, there are still a vast majority of cases where all the outlets are either not at all sewered or only partially connected, meaning thereby that only one or two outlets out of a number of them are given connection The real difficulty seems to be that several house owners do not have proper guidance in this respect and whenever they are pressed by the authorities, they employ some contractor and get one or two connections only and will not be in a position financially to take up all the connections at a time, but wait on, till notices are issued again In several instances, they will not know that it will be economical to combine all the outlets in their own premises into one internal drainage and have one sewer connection, and even if they knew it, they cannot do it for want of ready cash to meet the expenditure In some parts, especially in the interior of the City, it will not be possible to combine the outlets as mentioned above, and several connections have to be taken at some expenditure which the owners are not prepared to incur readily

There are the absolutely indigent, who are owning houses paying the minimum taxes and in their case, it has not been found possible to induce them to incur any expenditure and these houses have been given free connections to one outlet where internal drainage is good, and where it is not good, any connection given without proper internal drainage has become choked and out of use

The following methods are suggested —

1 The drainage staff to obtain plan and estimate for each house to be connected and after scrutinising the estimate and satisfying themselves that arrangements are properly made at a reasonable cost for purposes of such connections issue licenses This procedure seems desirable, as instances have been brought to notice, that some contractors have demanded exorbitant rates and having taken advance, from the constituents have not done the work either satisfactorily or promptly This arrangement to be in the case of houses the owners of which can afford the expenditure

2 In the case of people who cannot afford ready cash, the amount involved may be advanced to the owner, recoverable in 3 or 4 annual instalments along with the *mohatarfa* and with a small amount of interest The actual expenditure in such cases has to be carefully limited to the barest requirements after check of plans and rates in the drainage section

3 In cases of very small taxable houses, the work has to be estimated for as cheaply as will be consistent with good workmanship and if possible connecting all the outlets into one internal drainage properly to reduce the number of outlets to be connected into one This work has to be done by the drainage staff free of charges

4 Maintaining a list of approved contractors who could do this sort of work properly and permitting only these to touch the mains or sub mains

5. If the above are approved, a regular programme of work based on the amount that could be made available for loaning purposes, has to be drawn up for sustained and continuous work till all the outlets of all houses are connected

The points now requiring quick decision are the following —

1 Whether pumping is necessary in order to reduce the number of outfalls all round the City The fact that has to be borne in mind here is, that in spite of having pumping arrangement in one or two areas, the subsidiary outfalls cannot be avoided altogether

2 Whether the sewage of the different parts of the City may be allowed to gravitate to the nearest valley and the final effluent after being passed through septic tanks treated on land, in view of the fact that the City being an inland one, and not under any great obligation to bring the sewage to such a level of purity as is necessary for the effluent to be discharged to a live river or sea, and there will be lands available for treatment at moderate rate

3 Whether part of any funds that could be made available for final treatment at the outfalls may not with advantage be diverted towards giving loans to householders for taking complete house connections with modification of their internal drainage and on easy repayment system along with the tax and towards getting the necessary works done free to the purely indigent who are living in their own houses

Finally in arriving at any decision the broad fact has to be considered of the resources of the Municipality who have to shoulder the burden of the capital expenditure and the recurring cost Their normal revenue and expenditure will barely balance each other and their debt funds are accummulating They have to find out ways and means with their existing resources, to provide for sinking fund, interest charges and normal expenditure, incidental to a growing City with not very elastic means of raising extra revenue

The decisions to be taken are very urgent to enable the future work of the sewage seheme to be proceeded with

(Sd) N KRISHNIENGAR,

Sanitary Engineer

July 1937

II

BRIEF HISTORY OF THE BANGALORE DRAINAGE SCHEME

A complete scheme for the Bangalore City drainage was prepared by Mr D Cruz, in the year 1917 making provision for the underground sewage of the City and of the extensions as then existed, on the separate system, *i e*, excluding the drainage of the storm water The total cost of the scheme amounted to Rs 19,08,400

For various reasons, such as the heavy cost involved, considerations of financing and of the paucity of the water supply, the project as a whole has not been sanctioned and is put off, though drainage work in bits has been and is being done here and there in the City and extensions as part of the full scheme And similarly estimates for laying sub mains and street sewers in other parts of the City and extensions are under submission

Now that the main obstacle *viz*, paucity of water supply has been removed, the drainage question is urged to be taken up and pursued The Engineering details of the scheme as submitted by Mr D Cruz have been subjected to the scrutiny of several Engineering officers, and their opinions are available in the file Extracts from these opinions are given in the accompanying note For further details, the file may be perused

A comprehensive drainage scheme for the whole of Bangalore City under the present conditions including the old petta and extensions has not yet been prepared, and the concurrence of the Municipality and sanction of Government for the full scheme with all its financial implications in regard to both capital cost and maintenance expenditure has not been obtained

The scheme has now to be got up and estimates prepared with a view to getting an idea of the total capital cost of the scheme as well as of the recurring expenditure under the present conditions For this purpose, a regular survey of the areas not covered in Mr D Cruz's scheme has to be conducted, levels have to be run and checked with the existing levels of the drains already constructed and how far the latter done in bits do fit in, with the full scheme has to be verified

The question of outfalls has to be finally settled and the concurrence of the Municipality and sanction of Government taken to proceed on the lines to be finally pursued The points requiring decision to enable the full project being prepared are noted in the concluding paras of the foregoing note Pending such decision, field work of surveys and levels will be started to be conducted is as soon as the full complement of establishment now sanctioned by Government is posted by the Chief Engineer An inspection of the several points of outfalls round about the City is absolutely necessary by the Members of the Committee to come to a final decision

(Sd) N KRISHNIENGAR,
Sanitary Engineer

III

A NOTE ON THE TREATMENT AND DISPOSAL OF NIGHTSOIL, SEWAGE AND STREET RUBBISH

As matters stand in Bangalore City, the sewage system that has been partly constructed takes in, to a limited extent, nightsoil and urine from the houses and the house waste and kitchen waste waters From areas which have not been sewered, the open drains carry sullage including a little of nightsoil and all the urine from the city and all the sullage In course of time as the main and the sub mains are extended and as the Municipality makes use of the educative and legal powers, the number of house conections will increase and consequently the quantity of nightsoil conveyed will be larger and larger The period that will be required for all the houses to be connected to the underground sewer, for all practical purposes may be taken as about 10 to 15 years

For the present, the system of disposal of nightsoil and sewage is as follows —

The sewage from the main drain is taken to Sunkal Farm where the Horticultural Department is making use of it partly, and the local gardeners partly The rest passes through the storm water drain and gets into the Koramangala tank In addition to the main flood water drain, there are two additional big outfalls— one close to Kempambudi tank passing through a septic tank into distillery valley and a third outfall is from Malleswaram towards Jakkarayanakere valley

The nightsoil is being removed from the daily conservable latrines and taken away from the city by means of carts The Municipality gives away on contract every year, the right of taking away the nightsoil and street rubbish together There are at present 160 carts coming from the villages to take away both street rubbish and nightsoil collected both from the public and private daily conservable latrines

The subjects of conveyance and treatment of nightsoil from the daily conservable latrines which will continue to exist until all the houses are connected to sewers and also the conveying and disposal of street rubbish, should also be considered so that the problem that has to be considered becomes more a comprehensive one instead of purely the treatment and disposal of sewage

Conveyance of nightsoil from the daily conservable latrines —Until such time that all houses are connected to the sewer the Municipality will have to maintain a certain number of conveyances consisting of hand carts, bullock carts and motor lorries to carry the collected material from the houses to dumping stations

Dumping Depots for facilitating the removal of nightsoil to long distances — Suitable sites within the city will have to be selected in different parts and dumping depots constructed so that the nightsoil may be washed down into sewer Thus the nightsoil will be conveyed from the dumping depots through the underground sewer to the treatment and disposal site, thus avoiding the cost of buying and maintaining the larger number of conveyances that will be required otherwise

The collection of street rubbish and disposal —The collection will have to be done by the conservancy staff and removed by departmantally owned hand carts and bullock carts asssisted by a fairly good number of motor lorries so that the material may be carried to the place of disposal quickly

Disposal of street rubbish —There are two methods which could be safely adopted —(1) Incineration—Big incinerators of Horsefall type will have to be constructed and the ash utilised for filling pits and hollows close to the site where the incinerator is put up Money will have to be spent in constructing the incinerator, and an establishment maintained for separating the combustible from the non combustible matter for, proper site should be selected for disposing of non combustible matter for filling hollows (2) Second method—The Agriculturist wishes to make use of the valuable manure that is available in street rubbish The method for utilising the street rubbish for manurial purposes is by composting, using the street rubbish with any material that can disintegrate oxidise and make

it into a manure with a high nitrogen content For this purpose the activating material used is either crude nightsoil or suitable sludge that can be obtained from sewage treatment plants

Treatment of sewage —The sewage which is now containing nightsoil to a greater or less degree will contain all the nightsoil of the city when the dumping depots are established all over the city It cannot be allowed to be dealt with as it is at present, that is using the crude sewage directly on land It will give rise to bad odour, fly and mosquito nuisances and increase in the incidence of filth diseases such as Typhoid, Dysentery and Diarrhoea This state of affairs should not be permitted A suitable method of treatment has to be adopted so that the sewage, will become odourless will not be a nuisance, and will not allow flies to breed and will not create danger to public health

With the knowledge that we have on hand on the subject, it is theoretically possible to transform the sewage into clear and harmless drinking water but this would be too expensive for any Municipality to bear Sewage can be so freed from organic matters, that little or no danger of its creating a nuisance or a public health hazard, can be expected at a very much less expenditure The amount of purification required will depend on the quality of the sewage of the city and the metnod of final disposal It is also possible to sterilise the sewage effluent or sewage itself after removing the grosser impurities by chlorination

The next point to be considered is the ability of the Municipality to find the necessary funds The funds required will be for the following purposes while considering the different methods of treatment —

1 The first cost of constructing a plant, cost of keeping it in repairs and of making its extensions if necessary

2 The cost of chemicals or other materials, power when used, labour and supervision The actual annual cost of a proposed project includes cost of supervision, labour, materials required, interest on the investment and depreciation on the first cost

The choice would lie with that which shows the lowest total of the above items obtaining at the same time the maximum efficiency in purifying the sewage and finally disposing it of in a suitable and harmless manner either by land treatment when land is easily available or if it is the only means of disposal, letting it into streams or other water courses

To decide on the treatment method for adoption, local conditions have to be studied on the following points —(1) the site of disposal, (2) the quality and quantity of sewage, (3) the nature of soil if broad irrigation is to be considered, and (4) the degree to which the purification of sewage is to be effected If the ultimate disposal is to be into a drinking water source, the effluent after treatment should conform to the standard set up by the Royal Commission on sewage disposal

If the final disposal is to be on land it is not necessary that the purification should be effected to the same extent, but it must be satisfactory enough to prevent the nuisances and public health hazards

Local Conditions —In Bangalore, there are no rivers or sources of drinking water into which the sewage can be led into, requiring the treatment necessary to get the same standard of purification set up by the Royal Commission, as the object of the Municipality is to use the available water for irrigation Hence the method of secondary treatment will be land treatment

Selection of sites —There are two sites close to Bangalore (1) Sunkal Farm, where the sewage will have to be pumped up from the main sewer to the treatment plant to a height of 15 feet, and (2) the other at Koramangala tank, where the sewage will have to be pumped up about five to six feet The area of the land that could be commanded at the Sunkal Farm site is about 300 acres with the above pumping, and with additional pumping, another 200 acres The Koramangala tank site would command 1,000 acres

If the sewage of Bangalore City alone is to be taken into consideration for treatment and disposal, Sunkal Farm would be suitable to meet the demands as regards the availability of land, but if the sewage of Contonment also is to be treated at the same site, Koramangala Tank will be suitable In the latter case, the main will have to be extended to the Koramangala Tank site, *i e* , an additional length of two miles at an estimated cost of about three lakhs of rupees

Quantity and quality of sewage —The total quantity of sewage that is calculated to reach the outfall at present, taking into consideration water supply to the City, evaporation and soakage, is about two million gallons The quantity of the sewage to be treated can be taken as three million gallons, taking into consideration the estimated population of 10 years hence, though immediately there may not be the necessity for such a big plant The quality of the sewage in Bangalore as well as in Mysore have been analysed and found to contain suspended materials fairly easily settleable due perhaps to the common food of Indian people The result of analysis of crude sewage of Bangalore is as follows —

Chemical constituents	*Average of three samples*
Suspended solids	15
Albuminoid Nitrogen	2 9
Nitrite	
Nitrate	
Oxygen absorption (2 hours test)	14 8
PH value	7 7

Further, the local conditions are such that any scheme that is selected for adoption should fit in with the programme of preparing compost with the street rubbish

Consideration of profits from sewage —There may be suggestions that when a number of methods of treatment are adopted, it will be a source of gain to the Municipality I shall quote here an extract from a recent authority on sewage disposal " Some reports of success have been heard of, but when investigated, the details are found to be disappointing and the author knows of no case where the disposal of sewage is accomplished at a profit to the city or town This is not to be wondered at, since the value of the fertilising matters in one ton of Boston s Sewage, for instance, is estimated to be but one cent The sewage of several of our Western Cities situated in an arid region is disposed of for irrigation at a profit, because any water is valuable there '

' The endeavour should be to find for each place, that method of disposal which, under the existing conditions of location, character of sewage etc , will best meet the requirements both of the state laws and of the laws of sanitary science and which will be least expensive, both first cost and maintenance being conside red

The Legal Considerations —Legal standards have been set up in many countries for the purpose of avoiding pollution of sources of drinking water so that the people living below the point where the sewage joins the source of water supply as a river or a stream is not subjected to the dangers of public health hazards

Treatment of Sewage —Of the different methods of treatment, the following stages and methods are the ones that can be thought of in connection with the treatment of sewage

The various processes of sewage treatment may be grouped under the headings -

I Screening and primary treatment —
  1 Course screens, fine screens
  2 Sedimentation —grit chamber, septic tanks, Imhoff tanks, mechanically equipped clarifiers
  3 Chemical precipitation

II Secondary treatment —
  1 Filtration
    (*a*) Broad irrigation and sewage farming
    (*b*) Sand filters
    (*c*) Contact filters
    (*d*) Sprinkling filters
  2 Activated sludge process

III Final treatment
  Secondary sedimentation
  Disinfection

IV Ultimate disposal —
1 Dilution with current water as letting into stream
2 Letting into lake or ocean

V Sludge disposal
(*a*) Digestion
(*b*) Dewatering
(*c*) Compost making

The extent to which the sewage when fully charged with all the nightsoil of the City can be purified by the several methods will have to be considered so that the method that suits the conditions of Bangalore may be selected The efficiency of the plants, the cost both capital and maintenance are mentioned below

I Efficiency of several Methods—Primary Treatment

1 *Septic Tank* —The Department has the experience of septic tanks in Mysore Septic tanks are not now recommended for the following reasons

(i) The large size of the tanks necessary
(ii) Bad odour often emitted from the tank and the effluent
(iii) The breeding of flies on the surface of the tank and
(iv) The efficiency obtained is only to the extent of about 5 to 10 per cent, the tank serving more as sedimentation tank for grit and other settleable inorganic matter

2 *Imhoff Tanks* —Of two storied type, upper half serving as a sedimentation tank and the lower half as a digesting chamber for the sludge

The constructional cost will be very much more than the septic tank when properly designed When operated receiving well comminuted sewage will remove 90 to 95 per cent of the inorganic settleable solids and about 50 per cent of the settleable solids and 30 to 35 per cent of the total inorganic matter But the sludge undergoes decomposition as in a septic tank with gas formation and floating sludge It gives off abundance of gases, giving rise to odours The effluent from these tanks is free from the suspended matter to a very much more degree than septic tank, fresher and less odourous than septic tank effluents Much trouble is given by the scum which rises in great volume, particularly in tropical countries where the digestion of the sludge starts in about 4 hours as compared to about 24 to 48 hours in the temperate climates Imhoff tanks require good and continuous attention

3 *Mechanically equipped Clarifiers* —They are patented mechanical devices which are very expensive and give rise to fairly good effluent Most of these are patented and are usually employed with the next method -Chemical Treatment

4 *Chemical Treatment* —In the Chemical treatment of sewage there are two methods, one is sterilising the sewage with chlorine so that the sewage after passing through the grit chambers is treated with chlorine gas and made sterile and the other is the precipitation method by the addition of chemicals, like lime or iron salts and sometimes alum to coagulate all colloidal material The coagulum carries with it all the suspended matter to the bottom when sedimentation is allowed to take place The chemical that is commonly used is either copperas or ferric chloride The ferric salts produce rough and tougher flocs The sludge produced by sedimentation dries readily and putrefaction is postponed considerably by the chemicals The odour is controlled and the fly nuisance is prevented The amount of sludge produced is increased by chemical precipitation because more of the sewage solids are removed and of the quantity of chemical added The amount of wet sludge will be 15 to 50 times dry solids depending on the solids contained in the sewage The latest opinion seems to be that ferric chloride is the most economical chemical to be used Experiments conducted by the Department by the chemical precipitation method have given satisfactory results though floculators have not been used The quality of the effluent in places where all the necessary equipments have been provided as in Dearborne in Detroit has given rise to the employment of the method in several places in America recently The results obtained are reported to be the same as can be expected of an activated sludge plant, after passing the effluent from the sedimentation tank through filters as automatically cleansing magnetite sand

filters The experiments conducted in Mysore with the existing septic tank as sedimentation tank using about 80,000 gallons sewage with the addition of nightsoil at the rate of 6 oz of nightsoil to 20 gallons of sewage in three hours time

Suspended solids 90 to 92 per cent reduction and oxygen demand 60 to 62 per cent reduction, effluent odourless and the sludge odourless and not attractive to flies

II Secondary Treatment

1 While considering filtration under secondary treatment out of the four possibilities broad irrigation and sewage farming will be the method of choice, as one of the objects of the scheme is to utilise all the waste water from the city for irrigation purposes

I may mention here the results of analyses of the effluent of the Mysore Sewage Farm after passing through soil

	Crude sewage	*Effluent after broad irrigation*
Suspended solids	46	5
Free from saline ammonia	2 1	3
Albuminoid ammonia	1 05	375
Nitrites		present
Nitrates		present
Oxygen absorbed in 2 hours	5	4
Do in 2 days	13 3	1 1
Reaction	7 3	7 7

Activated Sludge process —There are three types of plants employing the same principle of Activated Sludge

1 The Activated Sludge process of the Activated Sludge Company Ltd, using compressed air or air blown into the sewage by blowers

2 The Agitation method as in Sheffield using power to work paddle wheels in channels bringing the sewage in the form of small particles in contact with air

3 The Simplex method, a patented method which is working in Bombay for the last year or two

As regards efficiency, the results obtained by the three methods are extremely good and the results satisfy the statutory requirements for allowing effluent into the rivers The results of the agitation methods are considered to be as good as obtained in Sheffield and from the experimental plant in Singapore

The results obtained from the simplex plant have been said to conform to the required standards

The points to be considered in particular in connection with the Activated Sludge process are —

1 The cost—capital and maintenance

2 The disposal of the sludge The sludge contains ½ to 3 per cent of solids and the quantity of sludge produced is about 2½ per cent of the total sewage treated, that is for three million gallons of sewage to be treated the total sludge will be 75 000 gallons per day

The question has to be considered as to how far this 75,000 gallons of sludge can be used in preparing compost with the 100 or 120 cartloads of rubbish that can be collected from the streets of the town While the sludge will be about 75 000 gallons the requirements for compost making will be 8 to 10 thousand gallons per day, that is the sludge will have to be concentrated by some method which would mean further investment and additional maintenance cost At the same time it is for consideration whether it is necessary to have the degree of purification for land treatment as can be obtained from Activated Sludge plant The analyses of the effluent after land treatment from Mysore Sewage Farm have given very good results

Dr Fowler in a letter to the Surveyor, referring to some experiments then in progress in the Bio chemical Department of the Indian Institute of Science, Bangalore said

"These researches lead clearly to the conclusion that the changes which go on in an Activated Sludge tank are essentially the same as those taking place in arable soil Activated sludge contains forms of life almost identical with those found in fertile soil Seasonal variations among these are noted similar to those which have been observed in the course of prolonged studies of soil phenomena at Rothamsted

The effect of selective antiseptics in inhibiting the growth of protozoa, with the consequent increase in the bacterial population, is much the same in activated sludge as in soil Both soil and activated sludge must be considered as living systems if they are to be properly 'managed''

FINAL TREATMENT

If Activated Sludge process is adopted a separate set of tanks is required for secondary sedimentation, and digestion and drying beds for converting the very dilute sludge into a flaky dry form for proper disposal either as manure or for burning

IV ULTIMATE DISPOSAL

Ultimate disposal of the effluent —This will depend upon the arrangements made for purification of the sewage The effluent after the primary treatment can be used on land as long as it does not create a nuisance and is not a source of public health hazard If Sunkal Farm is selected as the site for disposal, the little effluent that can be collected from land can be let into Koramangala tank If not, all the water will be utilised in the valley below Koramangala tank if the site selected is Koramangala tank site

Financial implications of the several methods —A statement of the capital cost and the maintenance cost including establishment, power charges, repairs and renewals and all other charges for maintenance and upkeep of the plant to indicate all the financial implications is given below

	Capital cost	Interest and depreciation ($4\frac{1}{2}$—$3\frac{1}{8}$=8/)	Bear maintenance cost	Total annual maintenance cost
1 Activated Sludge process	6 00 000	48 000	35 000	83 000
2 Simplex plant (as per capital investment of Bombay Corporation 2 75 M G Unit)	10 00 000	80 000	25 000	1 05 000
3 Bio aeration	5 00 000	40 000	25 000	65 000
4 Chemical treatment	1 25 000	10 000	35 000	45 000

The above figures are worked out by the Sanitary Engineer

The information received from Bombay about simplex plant is that it cost the corporation 12 lakhs of rupees to put up the plant to treat $2\frac{3}{4}$ million gallons and the cost has been reduced to 10 lakhs of rupees for Bangalore conditions of labour

As regards chemical treatment, in maintenance the cost of chemical is calculated at the rate if imported It is possible to manufacture the salt in Bhadravati as intimated by the Industrial Commissioner, when it is possible to reduce the cost of chemical to two thirds if not more

P PARTHASARATHY,

Director of Public Health.

IV

PROCEEDINGS OF THE MEETING HELD ON SATURDAY THE 25TH JUNE 1938 TO DISCUSS THE LINES OF ACTION TO BE TAKEN WITH REGARD TO THE BANGALORE CITY DRAINAGE SCHEME

PRESENT

1 The Second Member of Council
2 The Director of Public Health
3 The Secretary to Government, Local Self government Department
4 The Municipal Commissioner, Bangalore City
5 The Health Officer, City Municipality
6 The Sanitary Engineer

1 The appended statement shows the drainage works already carried out and those for which estimates have been sanctioned or are under revision

2 In the areas for which street sewers are provided, systematic action should be taken by the Municipality to ensure the completion of house connections

3 In regard to further work, it is necessary to draw up a comprehensive programme of the works remaining to be carried out in the several parts of the City, indicating the order in which they should be taken up, having regard to their relative urgency The programme may perhaps be roughly on the lines indicated in the enclosed map (not printed) and may be discussed in the Drainage Committee. Each stage of the programme may be so planned that one or more drainage areas are completely dealt with every year including provision for mains, sub mains, street sewers and interim arrangements where necessary for sewage disposal, the whole programme being spread over five or six years

4 Undeveloped areas for which an underground system is not immediately necessary should be separately indicated

5 For the purpose of preparing the skeleton programme referred to above, it may be assumed, for the present, that in addition to the main outfall at the Sunkal Farm, there will be three subsidiary outfalls *viz*, one across the Magadi Road for Malleswaram Srirampur, Seshadripur and Palace Guttahalli, the second towards Chennammanakere for portions of Basavangudi and the third below Kempambudhi tank for portions of Chamrajpet Shankarpur and the new extension on 'Buttfire Maidan

6 There is a ridge line north and south right through the City separating the Magadi road, Chennammanakere and Kempambudhi valleys from the main Koramangala valley as stated in para 5 of of the note If we cut across this ridge line by, say, 25 feet in depth, at suitable places, we may be able to take most of the sewage from the densely populated areas of these three valleys on to the Koramangala valley The sewage from the remaining portions of these subsidiary valleys is likely to be small as the areas are thinly populated As a final stage this small quantity of sewage may also be pumped up to the head of the sewers mentioned above The Sanitary Engineer may be asked to examine the above, thoroughly in consultation with the Chief Engineer

7 In the meantime, the respective advantages or otherwise of adopting the activated sludge or chemical treatment of sewage may be examined It is not necessary for this purpose to conduct any costly experiments with the chemical method of treatment The data obtained from cities where the different methods are in use should be sufficient for making a rough and ready comparison of their respective cost and efficiency

8 The area of lands available under Koramangala tank and the probable realisation from the sale of water for irrigation may be worked out in consultation

with the Executive Engineer, Bangalore Division, and the local Revenue Officers, and the financial implications of each scheme may also be definitely ascertained

9 The ovoid sewer which has been laid up to the Sunkal Farm is not fully used at present as the outlet is much below the ground level Pending the final decision of the question of extending the ovoid sewer to beyond the Koramangala tank and of the method of treatment and disposal of sewage there, the question of diverting the sewage to the ovoid sewer from the open drain and its utilisation by pumping for irrigation of the lands in the Sunkal Farm for the present may be considered and disposed of expeditiously

10 Some establishment has been sanctioned for the survey of the City with special reference to underground drainage The survey should be completed by the end of December 1938, entertaining if necessary, an additional establishment for which proposals may be immediately submitted

11 The Sanitary Engineer should keep the Director of Health and the Chief Engineer informed of the progress of work and seek the latter's advice on all important engineering problems including irrigation, arising in connection with the scheme

V

ACTION TAKEN ON LOCAL SELF GOVERNMENT SECRETARY'S No L 652 4, DATED 21ST JULY 1938, FORWARDING PROCEEDINGS OF THE OFFICERS MEETING HELD ON 25TH JUNE 1938, *RE* BANGALORE CITY DRAINAGE, IN THE OFFICE OF THE SECOND MEMBER OF COUNCIL

Para 2 In the areas for which street sewers are provided systematic action should be taken by the Municipality to ensure the completion of house connections

The Municipality has been taking action to have the houses connected to the sewers wherever they have been laid

Para 3 In regard to further work, it is necessary to draw up a comprehensive programme of the works remaining to be carried out in the several parts of the City, indicating the order in which they should be taken up, having regard to their relative urgency The programme may perhaps be roughly on the lines indicated in the enclosed map and may be discussed in the drainage committee Each stage of the programme may be so planned that one or more drainage areas are completely dealt with every year including provision for mains, sub mains, street sewers and interim arrangements where necessary for sewage disposal, the whole programme being spread over five or six years

A comprehensive scheme for the drainage of the whole City is under completion Details of the scheme are worked out having regard to the present conditions, taking out fresh surveys and levels Additional hands posted for the work were all engaged and the whole scheme is almost completed The rough programme noted in the map enclosed with the Local Self Government Secretary's letter under reference has been approved in the main by the Committee at a previous meeting The final figures for the whole scheme are now available and amount to Rs 50,00,000 A revised programme depending upon the funds that could be forthcoming every year will have to be prepared now In this connection it will be brought to notice, that the execution of the scheme prepared by Mr D Cruz in 1916 17 was put off to a more favourable period when the water supply of the City could be ensured by the completion of the Thippagonadanahalli project, and funds could be easily made available The long period that elapsed between then and now necessitated considerable changes in the design and cost of the scheme due to the phenomenal growth of the City on all sides during the period Now that the water supply question is settled, it is considered not advisable to postpone the execution of the present scheme for an indefinite period, especially in view of the fact that there has been a fairly good headway made in the work of laying the sewer lines in the City and extensions amounting to nearly five lakhs The utmost period that it seems desirable to spread the project over, is ten years On this basis, the amount that has to be found for the works remaining to be done out of the total estimate is Rs 45 lakhs approximately and the annual grant will have to be about 4½ lakhs The figure of 45 lakhs includes a sum of about Rs 13 lakhs being the cost of the simplex type of Activated Sludge process of treatment in the Koramangala and Magadi Road outfalls

Para 4 Undeveloped areas for which an underground system is not immediately necessary should be separately indicated

Para 5 For the purpose of preparing the skeleton programme referred to above, it may be assumed, for the present, that in addition to the main outfall at the Sunkal Farm, there will be three subsidiary outfalls, *viz*, one across the Magadi Road for Malleswaram, Srirampur, Seshadripur and Palace Guttahalli the second towards Channammanakere for portions of Basavangudi and the third below Kempambudhi tank for portion of Chamarajpet, Shankarpur and the new extension on 'Buttfire Maidan'.

Para 6 There is a ridge line north and south, right through the City separating the Magadi Road, Channammanakere and Kempambudhi valleys from the main Koramangala valley as stated in para 5 of the Note If we cut across this ridge line by, say, 25 feet in depth, at suitable places, we may be able to take most of the sewage from the densely populated areas of these three valleys on the Koramangala valley The sewage from the remaining portions of these subsidiary valleys is likely to be small as the areas are thinly populated

If this type of treatment is not adopted the balance amount gets reduced to Rs 32 lakhs To this has to be added the value of any other method of treatment to be decided If this happens to be less than the activated method, the annual grant that may be required will be proportionately less than Rs 4½ lakhs

These will be noted in the plan and will be submitted along with the completed scheme

Details of estimates are being prepared in accordance with this suggestion and are noted in the key plan The number of outfalls now assumed are—1 The main outfall to the east of the City along the Sunkal Valley to Koramangala tank area This receives the drainage of the whole of the old City, Visveswarapuram, and parts of Basavangudi Extension, as also the sewage from parts of the southern portions of Cantonment, such as Langford Town, Tasker Town and Nilasandra 2 The outfall is between the Magadi Road and Mysore Railway line This outfall line receives the sewage of the whole of Malleswaram area excepting a small portion of the north west of Malleswaram Extension, which drains into a separate valley westwards The area comprises the following portions (a) Venkatarangapuram, (*b*) Annayyappa s Block, (*c*) Palace Guttahalli, (*d*) Ranganathapuram, (*e*) Sripuram and Seshadripuram, (*f*) West End Hotel area, (*g*) Subedar Chattram Road Extension, and also the extensions of western side of ridge line, *viz*, (*h*) Srirampuram, (*i*) Labour Colony, (*j*) Ramachandrapuram and Minerva Mill area, (*k*) Railway Colony 3 The third outfall will be Kempambudhi kere Valley which (*a*) catches the sullage from the western portion of Basavangudi, (*b*) Shankarapuram, (*c*) Chamarajpet, excepting a small portion on the north western side which can be drained into the main sewer line by cutting across the ridge on the Mysore Road 4 Channammanakere valley to drain off portions of Basavangudi to the west including the Co operative Colony

Action on the lines indicated has been taken and the proposals are made in the estimate to cut the ridge line and to divert the sewage of the area to the west of the main ridge line running north to south and continuous to it wherever practicable These areas have been inspected in detail by the Chief Engineer and approved by him

As a final stage this small quantity of sewage may also be pumped up to the head of the sewers mentioned above The Sanitary Engineer may be asked to examine the above thoroughly, in consultation with the Chief Engineer

Para 7 In the meantime, the respective advantages or otherwise of adopting the activated sludge or chemical treatment of sewage may be examined It is not necessary for this purpose to conduct any costly expriments with the chemical method of treatment The data obtainined from cities where the different methods are in use should be sufficient for making a rough and ready comparison of their respective cost and efficiency

Para 8 The area of lands available under Koramangala tank and the probable realisation from the sale of water for irrigation may be worked out in consultation with the Executive Engineer Bangalore Division, and the local Revenue Officers, and the final implications of each scheme, may also be definitely ascertained

Para 9 The ovoid sewer which has been laid up to the Sunkal Farm is not fully used at present as the outlet is much below the ground level Pending the final decision of the question of extending the ovoid sewer to beyond the Koramangala tank, and the method of treatment and disposal of sewage there, the question of diverting the sewage to the ovoid sewer from the open drain, and its utilisation by pumping for irrigation of the lands in the Sunkal Farm for the present may be considered and disposed of expeditiously

Para 10 Some establishment has been sanctioned for the survey of the City with special reference to underground drainage The survey should be completed by the end of December 1938 entertaining, if necessary, an additional establishment for which proposals may be immediately submitted

Details for the simplex type of activated sludge treatment have been obtained for one outfall on the eastern side For the chemical treatment method, details are being worked out and will be furnished along with the complete scheme Experiment may be conducted.

Details of lands required for extending the main outfall line to Koramangala tank and those required for the treatment works have been collected and estimates are ready. A similar estimate for continuing the Malleswaram discharge up to the valley on the Magadi Road has also been prepared

An open channel is excavated from the last manhole of the ovoid sewer and sewage is now let in to flow in the said channel through the septic tank and on to the old storm water drain This arrangement will continue, until the question of extending the outfall line up to Koramangala tank is settled and the several works connected therewith are completed

An additional establishment consisting of five Sub Overseers was posted as per Government Orders, and the surveys are almost completed Preparation of the comprehensive estimate is being hastened The same will be ready in a couple of months

N KRISHNIENGAR,
Sanitary Engineer.

DISPOSAL ARRANGEMENTS FOR THE CITY DRAINAGE

Reference Proceedings of the Officers Meeting held on 25th June 1938 in the Office of the Second Member of Council, received with Local Self Government Department Secretary's letter No L 652 4, dated 21st July 1938

The work of laying underground street sewers and giving house connections has been steadily going on for some time past, and of late flush connections for latrines in the sewered areas are being enforced and are rapidly increasing in number Till recently, the details for the first and most important item of work of any City Sewage Scheme, *viz*, the site of the outfalls and construction of con nected works had not been decided Agreeably to the instructions contained in para 5 of the proceedings referred to above, four outfalls have been assumed and of these, the most important one is the Sunkal Valley which receives the drainage of the whole City proper, Visweswarapuram Extension and portions of Basavangudi covering a total area of nearly seven square miles The location of the outfalls having been settled, needful action has now to be taken in respect of securing lands required for these outfalls In fact, the works pertaining to outfalls have to take precedence in the programme of works to be carried out The main outfall line has been taken up to the Sunkal Farm and from there dropped into the storm water drain through an open cut across Sunkal Farm lands

Since it is decided to continue the sewer line in the same valley to near the Koramangala tank, and utilise the effluent for cultivation purposes as in the Sunkal Farm, lands have to be acquired for laying the continuation of the main sewer and for sewage farming

These lands belong mostly to Koramangala village and partly to Neelasandra village in the Cantonment limits, and both are inam villages Details about these lands have however been collected from the Revenue Department The value of acquisition comes to Rs 4 lakhs roughly When as proposed the sewage farm is transferred to the area round about the Koramangala tank, the present Sunkal sewage farm will be abandoned and laid out into building sites But this farm area, though almost flat and quite suited for laying out sites is the centre of the main valley which drains the major portion of City and part of the Cantonment The sub soil water here, is rather very high, *i e*, within about five or six feet below ground level

The Koramangala tank besides storing storm water, draining from a large part of the City, also receives sewage with the contents of flushout latrines *en route* The sewage is rapidly becoming concentrated as more and more flushing arrange ments are added on, resulting in the tank getting overgrown with acquatic plants, and weeds, giving rise to a lot of stench With a view to lower or drain off the sub soil water in the Sunkal area, to make it fit for building purposes and to prevent sewage leaking and collecting in the Koramangala tank, it seems desirable to prevent any storage in this tank For this purpose the storm water drain which now terminates in the tank has to be continued along the contour, cutting the waste weir as may be required and lead on to the tank lower down If this is done, the bed of the Koramangala tank will be laid bare and will be available as additional area for the proposed sewage farm Incidentally, it may be stated that a part of the expenditure incurred in the acquisition of lands required for this new sewage farm will be more than made good eventually when the Sunkal Farm area is laid out into building sites and sold The total area of the Sunkal Farm is 110 acres or 5,32,400 square yards If one third out of this be reserved for roads open space etc, the total area that will be available for laying out into sites will be 3,55,000 square yards Even if the rate be assumed the lowest at Re 1 8 0 per square yard, the realisation that may be expected comes up to Rs 5,32,500 Mr Krumbiegal is taking action to get up a lay out plan for this area Thus, this proposal pays the cost of acquisition and the sewage farm intended to be developed near Koramangala will become a paying concern either to the Municipality or Government if worked departmentally as in Mysore or even if let out on lease There are numbers of Tigalars whose lands will be thrown out of irrigation due to

diversion of the sewage from the open drain into the underground sewer, waiting for leasing out lands in this area

Of the other outfalls, the next in importance is the one beyond the Magadi road which is proposed to receive the drainage of almost the whole of Malleswaram and the area surrounding it, *viz*, Guttahalli, Seshadripuram, Srirampuram, etc, the sullage at present flowing there is being utilised by owners of lands beyond Magadi road, for growing vegetables to some extent, and grass largely The cost of acquiring lands required for this outfall comes up to Rs 6,000 calculated at the same rates furnished by the Revenue Department for Koramangala

The next one is the Chamarajpet outfall below the Kempambudi tank and it requires to be improved in good time

The last as at present settled, is the Channammanakere valley The habitations draining to this valley are just in the process of development and this has to be considered lastly

As already stated, Koramangala and Malleswaram outfalls are most important, and orders are solicited to get into correspondence with the Revenue Department for starting the acquisition proceedings in these areas as they will take some time

In financing the whole scheme, priority has to be given for (1) acquisition of lands (2) the construction of the main sewer lines of the several outfalls and (3) of the structure required for any treatment that may be decided upon eventually These are more urgent relatively to laying of sewers in the interest of the town

N KRISHNIENGAR,
Sanitary Engineer

VI

REPORT

In pursuance of Government Order No G 1945 6—P H 48 37 11 dated 30th August 1938 sanctioning the deputation of the Sanitary Engineer to Madras Hyderabad (Deccan), Poona and Bombay to study any special features in the sewage systems with particular reference to the method of treatment and disposal, the towns were visited and the points noticed are detailed below

Poona City

Population 1,98,078

(Inspection dates, 5th and 6th June 1939)

This is situated mainly on the river Mula and is completely sewered The sewage of the old town excepting that of two small areas in subsidiary valleys flows by gravity into one main outfall from which the sewage is pumped to the irrigated area under the Mula canal about 7 miles from the City The sewage from the subsidiary valleys is led into two pumping stations located on the river bank and pumped into the main gravitation sewer for nine months in the year, and during the remaining three months in the rainy season when the river is in floods, the sewage from these pumping stations is discharged into the river

The annual working expenses of these two pumping stations amount to about Rs 25,000 apart from repairs and renewals At the main outfall site the sewage which amounts to about 7 1 million gallons per day is after removal of detritus floating materials, and sand, pumped on to the irrigated area under the Mula canal without any treatment The Government in the Sanitary Department does this pumping free of cost to the Municipality up to a limit of 7 1 million gallons per day Any quantity above this limit will be charged for at Rs 180 per million gallons per day to the Municipality The sewerage is sold as manure to the cane growers under the Canal at rates varying between Rs 60 and 70 per acre, depending upon the market rate of chemical manure This is apart from Rs 40 per acre of land assessment on sugarcane crops under the canal The sewage is passed on to lands either by itself or mixed with canal water when required The sewage when not required by the lands as in the rainy season, is allowed to flow by gravity into the river, where it undergoes dilution largely and passes on If, owing to unfavourable market rates for (Ghur) Jaggery in any year, the numbers of applications for sewage are few, the extra quantity that cannot be used on land is passed on to percolate over porous murum soil on the river bank, to join the river after undergoing natural filtration through the soil The condition being so favourable in every respect for sewage disposal there does not seem to be any disposition to subject the sewage to any treatment

In respect of the sewage scheme in general, there is nothing special worth noting There are the usual public conveniences provided with flush tank arrangement in every compartment and these as usual are largely mishandled by the public and entail considerable maintenance charges

Poona cantonment which has a population of 35,807 has no under ground sewage

Bombay

Population 11 61,383

(Dates of visit, 7th, 8th, 9th, 10th and 11th June 1939)

The central and southern portions of the city have been sewered long ago and the total flow amounting to nearly 80 million gallons per day is pumped into the sea The northern portion is now being provided with drainage systems on a large scale, and the sewage from this area is subjected to the Simplex Type of

Activated Sludge process of purification The plants are located near the Dadar Railway Station (B B C I) and are at present treating anywhere between 7 and 10 million gallons per day The area occupied by the plants is small and compact in the midst of inhabited portion and of course, by virtue of the type of treatment, there is not much of the attendant smell or nuisance The sewage, after the usual screening and settling processes, undergoes further settling in large hopper bottomed tanks, the effluent from these being subjected to further rapid surface aeration in other tanks The final effluent which is clear and odourless is passed on to a storm water drain nearby, which discharges into the sea

The sludge from the tanks is collected into a common receptacle and is digested in a special tank A large quantity of gas is produced by digestion Part of this gas is supplied to the Municipal Hospital through a 6 000 R ft of 6" pipe line for purposes of heating, sterlising, etc , and the remaining quantity left over, is burnt away by means of special burners By supplying gas to the hospital for these purposes, the Corporation is saving an expenditure of Rs 20 000 per annum which it was incurring towards purchase of electric power

The sludge after digestion is deprived of water by allowing it to dry over specially prepared drying beds It was stated that when attempts were made to dry the sludge on these beds before digestion there was promiscuous breeding of flies and consequently drying was done only after digestion The digested sludge after drying, is used along with the town refuse for reclaiming marshy lands, of which it is said, there is a vast extent to last for about 70 years to come for filling up Since Bombay City is an island and there are no suitable lands available, sewage farming is not done The capital cost of this treatment plant is said to be nearly 11 lakhs of rupees and the annual maintenance comes up to nearly R 80,000

The sewage from the central and southern areas of Bombay amounting to nearly 80 million gallons daily is not treated at present, but is pumped into the sea after removal of floating materials and detritus The City Engineer, seems to be thinking of some other method of treatment, for this large amount of sewage, as he is of the opinion that the Activated Sludge process will be very costly both in capital and maintenance on account of the large volume to be dealt with Chemical treatment is one of the methods he is thinking about, but he says that will also be very costly unless the chemical required can be cheaply manufactured in this country. Whatever the method of treatment, there seems to be the idea to utilise the gas derived from sludge digestion for running municipal lorries and the sludge for filling marshy areas Bombay is an important and big City in India and he seems to be anxious to do something to move with the times He said, he has recently visited Europe and he has not yet found time to write his report

In regard to the general layout of sewers, the following points were noted The City being on the sea coast is almost flat and the several localities are barely a few feet higher than the sea level to which the sewage has to be drained Besides, the Port Trust Authorities do not allow the sewage to be discharged to the sea anywhere on the Eastern side and this circumscribes, to an extent, the Engineer s liberty to deal with the sewers of some of the localities otherwise than by pumping, as he has to divert the whole sewage to the west only Also, on account of the small difference in levels between contiguous areas of the City, pumping has to be resorted to, in several places in order to avoid deep cutting for a purely gravity flow from all areas The old Shone s System of Ejectors which were giving trouble are also provided with pumps in addition and they are not any longer used in areas newly sewered Only centrifugal pumps are used

With regard to public conveniences, the only point worth noting is the under ground lavatory in the crowded square in front of the Victoria Terminus and the Corporation Buildings The top portion is completely enclosed by ornamental railing the roof paved with ornamental and glass tiles and provided with neat ventilators A smaller edition of the same may perhaps be done in Bangalore somewhere near the Market Square In respect of private house connections, the City Engineer stated that the response of the public to the several municipal notices had been very poor, the total number of connections taken in a year having been as low as 300, a figure ridiculously small for a big City like Bombay To improve matters in this respect, a system of subvention to poor people was introduced, whereby the Municipality undertook to bear half the cost of connections, the result being that now almost all the houses are connected

The collections of matter from areas still to be sewered are dumped into an enclosed manhole and flushed down as usual

HYDERABAD

This town has admirably lent itself to a sewage system, situated, as it is, on both banks of the river Musi The several street sewers are intercepted by two main sewers laid on both banks parallel to the river The right bank sewer is finally syphoned below the river and joined to the left bank sewer some distance away from the town, and the main line formed by the junction of the two, is taken on to the disposal site about 2½ miles away

The disposal works laid out, are very simple, consisting of grit chambers, preliminary settling tanks and septic tanks and finally the effluent channel for leading water for irrigation The grit chambers consist of three tanks of suitable size two for constant use and one to be a standby for use when any one of the two has to be cleaned Grit is removed by a travelling crane running on rails with a grab attached The grab picks up and empties the grit into tipping trollies which rail away the stuff and dump into areas selected for filling The grit is here spread in alternative layers with fresh earth about six inches deep Floating matters are arrested by screens fixed at the end of grit chambers

From the grit chambers, the sewage freed from floating stuff and deprived of heavy grit, passes on to preliminary tanks These also are in three sets one being kept spare when two are working The next in order that receive the sewage are the three septic tanks As usual, a layer of scum forms on the surfaces of the sewage in these tanks, and anaerobic action takes place below In order to supress odour and prevent fly breeding the scum is always covered over with a layer of paddy grass on the top This has the desired effect and the whole area is absolutely clean, and without any offensive smell and there are no flies A little smell is only perceptible when the effluent is flowing in the effluent channel at the other end Suitable arrangements with valves are provided for leading the sludge from the preliminary septic tanks to sludge wells from which they are lifted by buckets fixed on endless chains The sludge thus lifted is trolled to a specified area for layering with alternate earthing But, in recent years, recognising the manural value of the sludge, the vegetable and fruit garden owners are purchasing almost the whole of it at annas eight per cart

The effluent after being sprayed with chlorine is mixed with canal water flowing near the disposal site and is used for growing sugarcane paddy, etc , by the Drainage Department There is no special treatment given The whole work is under a Chemist who analyses the effluent from day to day This analysis enables the Chemist to determine the stage at which any septic tank has to be taken up for cleaning and it is said that about three to four years has been this period It is considered that a good deal of sludge digestion seems to take place in the septic tanks

A good portion of the town is sewered and there is nothing very important to mention in regard to details The town is susceptible of being drained into one common outfall There are only two low lying portions from which the sewage is pumped to the main sewer and the head in both is not more than 30 to 40 ft Fool proof public latrines, as built in some places in Mysore and here, have been built at Hyderabad also The visitors have nothing to do with flushing arrangements which is of the automatic type and there are no parts to mishandle and damage In this town too, there are one or two dump down manholes with flushing arrangements to dispose of the latrine contents from some of the undeveloped and unsewered areas

The undersigned had an interview for more than an hour with Nawab Ahsan Yer Jung Bahadur C E , (Cooper s Hill), Chief Engineer of the Drainage Department who designed and constructed the Hyderabad Drainage His expert view is that no elaborate treatment works are necessary in the case of Indian inland towns, and that disposal works as designed for Hyderabad may with advantage be adopted He does not favour any chemical treatment for our sewage and stated that the cost may as well be avoided The concluding portion of his note on Hyderabad sewage disposal works is reproduced below

"Problems connected with the sewage disposal of inland Indian towns are quite different from problems in colder climes of the West '

"Here sun shines throughout the year and the average temperature ranges well above 80°F Activated Sludge systems and other mechanical appliances are more suitable for colder climates, specially where land is not available for disposal by broad irrigation But in a country like India where land is economically available and natural agencies such as, sunshine and high temperature help sludge digestion and disposal to a great extent, it is more convenient and economical to adopt disposal by broad irrigation

"A simple system of preliminary treatment followed by suitably combined digestion and settlement of sewage before its application to the crops, with suitable dilution wherever possible, seems to be all that is necessary in this country

Madras

This is almost similarly situated as Bombay on the sea coast with the general levels, only a few feet above the sea level It does not easily lend itself to a common gravity scheme or for more than one outfall No special features were noticed in the general scheme The sewage is simply led on to the sea and in this locality the land is undergoing continuous erosion by the action of waves, necessitating the shifting of the disposal point sooner or later There is no treatment given now The Activated Sludge type of treatment is being considered for some time past its heavy cost as well as other problems, such as, de watering and drying the sludge, profitable disposal of effluent, etc , seem to be the retarding factors in coming to a decision It was stated that the sewage of one small area may be purified with this method as a trial

Bangalore

Each one of the towns visited has its own peculiarities of topography and special circumstances, and the disposal of the sewage is carried on to suit such circumstances The case of Bangalore is different in most respects It is an entirely inland town It is not situated on a river as Poona or Hyderabad, or on sea coast as Bombay or Madras, nor has it a canal irrigated tract in close proximity, as Poona or Hyderabad Again, the general lie of the land on which Bangalore has sprung up, is widely at variance with the other towns Poona and Hyderabad are built on more or less even contoured surface, easily admitting of one outfall, towards the river valley though involving pumping of sewage, at not much cost, from one or two low lying tracts in the town Bombay and Madras by virtue of their position on the margin of the sea coast, cannot but have one disposal site into the sea, and cannot avoid pumping sewage from several areas of slightly varying surface levels Bangalore on the other hand, has its topography very much cut up by ridges and valleys The whole of the old town is nicely located on both sides of a wide valley draining towards the East, and easily lending itself to one gravity outfall, but the extensions have sprung up alround the old town on ridges and valleys rendering it extremely difficult to have one outfall without pumping, from nearly 7 to 8 different contiguous valleys with great differences in levels on the western side, and consequent heavy capital and recurring cost It has, on this account been decided that for the present the drainage of the City and the whole or such portions of the extensions as can be easily joined by gravity to the main line, may be taken to the disposal site on the Eastern side, and the drainage of the subsidiary valleys which will be very limited in quantity may be disposed off in the respective valleys where lands can be easily had for sewage farming

The proposed main outfall near Koramangala receives about two-thirds of the total drainage of the City, part of which is now utilised as it comes, without any treatment, by the Sunkal Sewage Farm and the rest goes into the Koramangala tank This tank is now recommended to be drained away thereby preventing storage and the bed thus released, together with the lands below, are intended to be used for irrigation with sewage instead of at the Sunkal Farm It is considered desirable to subject the sewage to some method of treatment, if not to purify it to the required standard, atleast to abate the nuisance caused by smell and fly breeding and safeguard public health, in view of the fact that the sewage is becoming charged with more and more of the contents of the increasing number of flush connections in the City In the West, the question hinges upon how best to avoid stream pollution as many of the towns have been built on river banks They have thus to think of methods to purify the effluent to the highest degree

possible before it is dropped into the river for dilution and self purification and incidentally, how best to render the sludge harmless and dispose it off

Of the methods of disposal, there is no scope here for dilution, for want of a perennial river or irrigation channel Purification by the activated sludge process seems to be beyond the present financial capacity of the Municipality Disposal on land by broad irrigation for which there is considerable scope is the only feasible proposition in the case of this City

Adding chemicals to the sewage freed from detritous and floating matter, accelerates the subsidence of colloidal matter held in suspension and solution, and renders the supernatant effluent purer and clearer than before The clear effluent may be passed on to lands for cultivation purposes The question arises as to how to deal with the large amount of sludge thus precipitated Again, a fairly big area of land will be required for forming special sludge drying beds, and it will be found difficult to set apart this extent of land from the area available for irrigation Also, the formation and periodical overhauling of these beds will entail capital and recurring expenditure

For these reason , sludge digestion and drying has perhaps to be ruled out , as an alternative the feasibility of the proposal to utilise the undigested sludge for the preparation of compost from the City garbage has to be examined The undersigned is one of those who was intimately connected with the work of compost making when it was first started in Mysore, and for over four years afterwards, and is thus in a position to deal with the subject and its implications in some detail

In Mysore, though, flush connections have been rapidly increasing for the last ten years, there are still areas unsewered where dry system of conservancy is being adopted The house holders and tenants in these areas were engaging Municipal scavengers for daily removal on small payments The contents were in several cases being dumped into the street dust bins full of town refuse of every kind, and contractors and private individual villagers were taking away this mixed refuse according to long usage This method was obviously a most filthy and insanitary one and there used to be days when even such removal was being omitted on account of rains, festivals, etc and consequently the stink in some of the interior portions, due to accumulation of filth, would be intolerable To see if this state of affairs could not be improved, and better sanitary conditions created, the idea originated of utilising the town refuse and night soil of unsewered and unconnected houses in sewered areas, for making compost and selling the resultant manure with its rich nitrogenous contents, at a profit to the Municipality It having been decided to start compost making, to secure a steady flow of the two ingredients *viz* , the night soil and rubbish, the Municipality had to take control of their conservancy through its own agency It was found that the following organisation was required (1) scavenging of private houses through Municipal paid staff, replacing the existing system of inmates themselves arranging the removal by private agreement with the scavengers This necessitated the levy of a special cess on houses varying from Rs 3 to Rs 12 a year depending upon the rental value and the levy was sanctioned Each scavenger was allotted a certain number of houses, the Municipality thus taking up the heavy responsibility of individual house cleaning It may, in passing, be noted here, that this arrangement deprived the scavengers of their private income. Though they were given increments to their wages, the apparent loss of private income, did not reconcile them to the innovation They were not regular in their duties and the inmates of houses were loud in their complaints about their remissness Though the Municipality did their best to remedy these lapses, the complaints still persisted and finally ceased the house holders again arranging with the scavengers by paying a small coin every month for regular attendance (2) For transportation, a battery of night soil carts with bullocks and drivers of the particular class who handle the stuff were required, each cart being assigned to a particular set of houses (3) Town rubbish, another important article for making compost, had to be conserved and arrangements made to collect, transport and stack it in the compost area Labour was required to remove and collect in a central dumping ground, the rubbish from interior lanes and bi lanes where carts could not go Bullock carts and drivers were employed to transport rubbish from these dumping grounds, and from small roads inaccessible to motor lorries, to another central dumping ground to feed the lorries for rapid transportation (4) To secure the maximum output of matter and rapid removal of rubbish in the town, and also in order that much time may not be lost in the process of moving to and fro,

arrangements had to be made for stabling rubbish carts and bullocks in places more or less centrally situated from their sphere of work To do this in Bangalore which is crowded, it is possible that private property may have to be acquired (5) Arrangements to safeguard the lives of the large number of costly livestock that have to be maintained, by employing good veterinary help, and efficient organisation for supply of food and fodder to them are necessary (6) Country carts and motor vehicles being liable to damage in the course of their movements, means to ensure their efficient and speedy repairs have to be created If these are entrusted to private factories, the Municipality has not the means nor the agency to check, that these repairs are properly done, that the rates are fair or that the workmen have done the repairs properly and not in such a manner as to ensure a steady flow of such repair works to the firm, from the Municipality Doubts and suspicions are sure to arise with no satisfactory means of allaying them It will therefore be inevitable for the Municipality to open a fairly good workshop of its own, with the necessary wooden and iron materials for replacing and renewing the iron tyres, spokes of wheels, etc , and spare parts for motor vehicles with a staff of carpenters, smiths, fitters, etc , under a competent and responsible supervising officer who keeps regular accounts of all repairs and their cost

These are a few of the details in connection with compost making, and if it is the intention of the Municipality to launch the scheme, it will involve it in an additional line of work with capital and revenue expenditure, not hitherto borne by it What these will be in the case of Bangalore, is not easy to forecast, by one who is not connected with the Municipality and it is for the Municipal Executive to work out the details having regard to the Municipality s resources in respect of the quantity of rubbish and night soil that can be collected, the number of carts, bullocks etc that may be required and other details

If it is intended to try compost making only from the sewage sludge at any of the outfalls, all the items of organisation except numbers (1) and (2) mentioned above will be required In addition a fairly big area of land in the sewage farm tract will have to be permanently set apart for storing all the rubbish necessary for treating with the sludge as soon as it is recovered and so that it may not be allowed to rot for want of rubbish In regard to market for compost, it has to be stated that so far there has not been any encouraging result in Mysore as far as private sale is concerned From the commencement till now the Government Agricultural Farm on the Irwin Canal at Mandya, was the only consumer practically Now, this farm is making its own farm yard compost and to this extent the position at Mysore will be worse and the stock will be held up until private consumers come forward to purchase it Though Mysore City is practically surrounded by canal irrigation in its close vicinity, that there should not be any demand for a valuable manure of this kind is regrettable The cause is due to the system of land tenure The writer has put in a fairly good service in the irrigation area near Mysore and it is within his knowledge that a very high percentage of the land owners are not cultivators The lands are invariably leased out to cultivators on uncertain tenures, in return for stipulated quantity of produce The owners interest ends with securing this quantity without interruption If the cultivator reduces this quantity, or another competitor offers to increase the return, the lands will change hands from cultivator to cultivator and thus the tenure is uncertain The cultivator has thus no incentive to purchase good manure and grow more crops The cultivators too have not kept up faith with the land lords as is evidenced by some of them not keeping up to their agreement and consequently, the landlords are forced to change cultivators more often In this vicious circle of circumstances, it is found difficult to introduce any improvement

In respect of Bangalore it is possible that such conditions do not exist and there may be intelligent large landed estate owners who may be prepared to purchase a manure of the kind But, the bulk of the cultivators being holders of small extent of lands will rest satisfied with their household farmyard manure and may not care to purchase manure from outside The operations connected with compost making, will involve the Municipality in additional expenditure It is their obligatory duty to look to the speedy removal of dirt and filth away from the town and dispose them off at some expense without any expectation of tangible return If, however, they are fortunate enough to earn anything in the process of disposal, it may be considered only a windfall and no return on capital spent may be expected, at least for some years to come

The question now arises as to how to deal with the Bangalore sewage in regard to its disposal in the special circumstances of its situation The conditions as regards topography as well as finance, make it imperative at least for the present, to have more than one outfall The most important of these is the Koramangala outfall on the East of the City, which has to dispose off about two-thirds of the City s sewage Lands for broad irrigation are and can be made available Being an inland city, it may be unnecessary to aim at such a high degree of purity as is fixed by the Rivers Pollution Committee in the West The method widely advocated for obtaining a high degree of purity is the activated sludge process of purification, and municipalities far better placed than Bangalore in respect of their resources are still giving serious consideration as to its adoption on account of its first and maintenance cost and other difficulties and complications as to sludge drying and disposal, complicated machinery and highly technical nature of opera tions A variation of this, *viz*, the simplex Type is also costly, as can be seen from the following remarks of the Consulting Engineers in charge of experiments conducted in Nagpur a few years ago

"The question as to whether the most satisfactory form of aeration would be the activated sludge air blowing or Simplex mechanical agitation has been a difficult one to decide, the difference in cost between the two systems is remarkably small" (From Dr Fowler s note to Madras Corporation)

These methods of treatment for Bangalore are out of the question for the present The next is chemical treatment

Expert opinion in regard to this is that the chemical is very costly and the cost may as well be avoided Even in America, though there have sprung up in recent years, several disposal works with chemical precipitation as a means of purifying the effluent many of them seem to be using it only as a seasonal treatment A perusal of the following extracts will be interesting

"Already about 60 chemical treatment plants have been built in the United States A few utilise chemicals as a continuous procedure, but more, only seasonally Chemical treatment is regarded as an intermediate process yielding an effluent suitable for further treatment or disposal by dilution with or without disinfection

"In 1938, according to the available information, 86 chemicals precipitation plants are in operation and 14 are under construction Chemicals are being used at 8 plants for odor control and at 14 plants for sludge conditioning prior to de watering without doubt, inaccuracies in the lists will be apparent in several instances Some plants equipped for chemical treatment have abandoned the use of chemicals Others have changed the method of treatment

" Ferric chloride and chlorinated copperas are the favoured precipitating chemicals with alum and ferric sulphate in less vogue The plants using lime to assist coagulation with ferric salts are not relatively numerous A few plants use lime alone and a few use special substances such as carbon It is worth noting that a number of plants, principally in New Jersey previously using ferric salts have gone over to alum as a precipitant for reasons of economy and convenience in chemical handling

"Significantly, the majority of plants in operation, or under construction, contemplate only a seasonal use of chemicals, usually during the recreational summer months or during period of low flow in diluting streams For example, the Minneapolis St Paul Plant of 134 million gallons a day capacity, which went into operation early in 1938, has equipment for chemical treatment Although it is estimated that chemicals will be needed only 1 5 per cent of the time, chemical treatment has not yet been used Denver Colo is the second largest plant in the United States equipped for chemical treatment with a capacity of 54 million gallons a day This went into service in January 1938 Seasonal use of chemicals is planned to cope with conditions of low stream flow, but no use of chemicals was reported in 1938 It is also significant that the majority of plants employing chemical precipitants for twelve months' operation rely mainly on other processes, such as sand or trickling filters and use chemicals in order to decrease the loading on those processes or to step up their overall efficiency Exceptions to the last statement are in Dearborn and New Britten installations, which were aimed to compete with oxidation processes on equal terms of continuous operation, efficiency and cost'

There is no doubt that chemical precipitation is one of the means of purifying the effluent Since we are not discharging the effluent into any river, but using it only on land, is it necessary to have the treatment and aim at such a degree of purification?

If not, the only method of disposal that can be adopted in Bangaloie for the present is the 'Land Irrigation method' as is done at Hyderabad passing sewage through detritus preliminary and septic tanks using effluent for irrigation and sludge sold as manure as is done there If the chemical can be manufactured cheaply, provision may be made to apply this method in any one of the small out falls to gain experience In the other small outfalls sewage may be disposed off on land for growing rhodes grass as is now being done after passing through detritus and settling tanks and the sludge may be sold or burnt being small in quantity

In years to come, when the city finds itself in more affluent circumstances, up to date methods of treatment may be thought of as, by that time science will advance further and solve the difficulties now being experienced in regard to the methods under consideration

SUMMARY

	City	No of outfalls	Pumping	Disposal	Remarks
1	Poona	Three during flood season One at other time	2 Subsidiary 1 main outfall	Land irrigation	No treatment
2	Bombay	One to sea	A number of pumps are installed	Sea	A small portion treated and the major portion untreated
3	Hyderabad	One	2 pumps	Land irrigation	Septic tank
4	Madras	One	Several pumps	Sea	No treatment
5	Bangalore (proposed)	1 main 3 Subsidiary	One at the out falls	Land	Septic tank provision or chemical treatment if feasible

(Sd) N KRISHNIENGAR,

GOVERNMENT OF MYSORE

No 308

Encl As noted hereunder

OFFICE OF THE SPECIAL OFFICER,
CITY DRAINAGE DIVISION,
Bangalore, dated 29th February 1940

FROM

N KRISHNIENGAR, ESQ, B E
Special Officer,
City Drainage Division,
Bangalore

To

The Director of Public Health in Mysore,
Bangalore

Sir,

With reference to your letter No C 38 › 167, dated 27—29th January 1940, forwarding copies of letter Nos 6145—Ml 143 39 9, dated 10—12th January 1940, from the Secretary to Government, Law Department, to Municipal Commissioner and Municipal Commissioner s Memo No A1 1031—38, dated 22nd January 1940, requesting to send very early comprehensive detailed scheme, as required in letter No 3491—Ml 143 38 7, dated 2nd October 1939, I have honour to enclose herewith all the estimates, with a report for each of the estimates together with the report on the comprehensive scheme of underground drainage in the City of Bangalore for needful action

The total cost of the whole scheme of Bangalore City Drainage is Rs 45,65,000 If the amounts set apart for house connections in the respective estimates amounting to Rs 4,39,859 and the amount sanctioned from time to time, for underground drainage scheme for Rs 9,94,846 totalling Rs 14,04,705 are deducted, the net amount to be further sanctioned for the whole Bangalore City Drainage Scheme, is Rs 31,30,295

Enclosures

(1) Report on the Comprehensive Scheme of Bangalore City (2 copies)
(2) Report on the sewage disposal of Bombay Poona Hyderabad (Division) and Madras (2 copies)
(3) One file containing twelve estimates with plans pertaining to Kormangala Valley as noted on the face sheet
(4) One file containing estimates and plans as noted hereunder —
  (*a*) Channammanakere Valley one est mate for Rs 65 000
  (*b*) Kempambudhi Valley one estimate for Rs 1 80 000
  (*c*) Magadi Valley four estimates for Rs 6 12 500
  (*d*) Munireddipalyam one estimate for Rs 35 000
  (*e*) Public Conveniences one estimate for Rs 15 000
  (*f*) Survey Charges one estimate for Rs 4 000
  (*g*) Laying sewers in undeveloped areas one estimate for Rs 1 77 671
  (*h*) Disposal Works one estimate for Rs 8 00 000

I have the honour to be,
Sir,
Your most obedient servant,
N KRISHNIENGAR,
Special Officer,
Bangalore City Drainage Division,
Bangalore

REPORT ON THE COMPREHENSIVE SCHEME OF UNDERGROUND DRAINAGE IN THE CITY OF BANGALORE

Preliminary — This report is prepared on general lines avoiding as far as possible purely technical details and referring only to points which have a bearing on the scheme directly or indirectly

It gives, in broad outline, the general history of the Bangalore City Drainage scheme in a compact form for future reference

Reports referring to technical details are enclosed with every individual estimate for purposes of technical scrutiny

1 Growth of the City

Bangalore City in the nineties, was a compact unit built on the Dharmambudhi Tank valley, which runs in the direction 'North West to South East' The City limit was roughly confined to the area between Arlepet Road and Lalbagh Road, and between Mysore Road and Kitchiah Chetty Chattram Road (the present Kempegowda Road) The Fort area was also part of the city, extending southwards from the City Market During the time of Dewan Sir K Seshadri Iyer, two extensions had come up just then, *viz*, the Chamarajpet extension on the Kempambudhi Tank Valley, and the High Ground Extension to the North of the Race Course Grounds, draining towards what was then known as Tumkur Road Tank, near the present Maharaja Mills The town was becoming overcrowded The population according to 1891 Census was 80,285 The sanitary condition of the town, required urgent handling, by opening out to congested portions, and affording areas for the inhabitants to move to out more open spaces The visitation of Plague for the first time, in the middle of the year 1898 in a virulent form, and its reappearance in the next three years in a more or less endemic form, scared the people Many ordinary residents of the City left it for the moffusil and the population in 1901, dwindled down to 69,441 (from 80 285 in 1891), due to deaths on account of the epidemic, and migration to moffusils This scare however, diminished in subsequent years The immediate opening out of the old town and the provision of new extensions was a necessity however The locality which suffered most from plague, was the old Tharagupet, and the area round about Mamulpet, in spite of its neat and high palatial building was the worst sufferer and after the cessation of the first and severe wave of the epidemic the street had a very depressing effect on the minds of people who had known it previously At this juncture, the New Tharagupet was formed as a business extension and merchants who did not take kindly to it had to be forced into shifting there to relieve congestion in the Old Tharagupet The Basavangudi and Malleswaram Extensions had their genesis then, and in their wake, came the other extensions, *viz*, Seshadripuram, Visweswarapuram Gavipuram, etc, so that at the present time, the area of the City has exceeded 13 sq miles The loss of fear of Plague in subsequent years the introduction of the amenities, such as water supply in 1896, electricity in 1903 04, the development of industry and trade, and above all, the very equable and salubrious climate of Bangalore gave a good fillip to the rapid increase in population, and to the growth of the extensions in quick succession The City has thus had a phenomenal growth and its population between 1911 and 1931 had increased in 20 years, from a little over 88,000 to over 1,72 000, *i e*, nearly 96 per cent and is still on the increase It is calculated that it will reach a figure approximating to 2 3 lakhs in the ensuing census of 1941

The town recovered quickly from the effects of Plague as evidenced by the steady growth of population after 1901 The people took to the extensions with great avidity, and built new houses The volume of business perceptibly grew in the City, so much so that such of the areas, as were predominantly residential, became thick business centres and large numbers of people including merchants who were unwilling at first, shifted their houses to one or the other of the extensions The advent of the University with the constituent Science and Engineering Colleges, and Schools made the place an even more important educational and

cultural centre This beautiful city, thus growing in size and importance as a health and summer resort, and as a crowded business centre, required attention in respect of its general layout, provision of open space, parks, roads, beautification and sanitation To consider these questions in all their bearings and formulate suitable proposals, the Municipal City Improvement Committee was reconsti tuted in December 1913, during the time of Sir M Visweswaraiah, and the Committee in its report submitted in July 1914, suggested improvements under the following four heads

IMPROVEMENTS

1 Better sanitation
2 Direct communication to different parts of the city
3 More accommodation for gradual expansion of the City
4 Beautification of the important portions of the City

There has been steady progress under all these heads More direct communi cation has been afforded to all parts of the City and extensions Sufficient accommodation for the gradual expansion of the town has been and is becoming available and the City is extending in all directions though the way in which the layouts are given and approved and the manner in which the houses are constructed are matters which do not fail to create a sense of discomfort in the minds of town planners and Sanitary authorities

Important parts of the city are visibly undergoing sustained and intensive beautification and one finds the places getting transformed beyond all recognition Many streets have been widened, asphalted, provided with foot paths, lit up with brilliant lights, fresh open spaces created, the existing parks and gardens improved and renovated and new parks and gardens brought into being all over, so that to day fine recreation grounds are made available within easy reach of the people of all parts of the City and the extensions These amenities, the public of Bangalore owe largely to the earnest solicitude for the welfare and comfort of the people, on the part of the Dewan, Sir Mirza M Ismail

2 DRAINAGE HISTORY—WORK DONE

This subject is included under the first of the subheads, *viz* '*Better sanitation*' The interior of the city is almost fully provided with box drains, *i e*, rectangular slabbed drains The waste water from the houses is collected in these drains which in turn discharge into the big open drain known in those days as '*Bowring Nala* running along the centre of the valley right through from Dharmambudhi Tank to Koramangala Tank and beyond

In the extensions, pipe sewers had been laid in Chamarajpet, Basavangudi, Malleswaram, Shankarpur and Visweswarapuram, to drain the sullage of the houses In the first three of these extensions, pipes are mostly laid on the main and cross roads while the waste water is collected in small open surface drains, laid along the conservancy lanes and is dropped into the manholes at either end through leaping weirs

Evidently, this method was adopted, as there was no idea of taking the night soil of the houses into the sewer pipes, owing to dearth of adequate water supply and with a view to keeping down the initial cost Experience has shown that leap ing weirs get choked by floating matter, and this chokage has to be frequently relieved or else the sewage will continue to flow in the open drain, as it is invaria bly happening now, thus defeating the purpose of the underground system of drainage

A combined system of Drainage for both storm water and sewage is not indicated for Bangalore, on account of its topographical features, as well as its heavy cost The separate system where the sewage drains will be absolutely independent of the storm water, would be cheaper in view of the physical features of this town In Shankarapuram and Visweswarapuram extensions, the separate system has been completely adopted and it is giving satisfaction

3 DISPOSAL OF SEWAGE

In connection with the drainage works mentioned above, the idea being to tap only the sullage of houses owing to the heavy cost of underground drainage and

the indifferent conditions of water supply in several parts of the extensions, probably no serious attempt seems to have been made for the treatment and disposal of the sewage at the outfall The drainage of the interior of the old city, Visweswara puram and portions of Basavangudi was simply discharged into main open storm water drains The sewage of Chamarajpet, Shankarapuram and portions of Basavangudi draining towards a common valley, was taken below Kempambudhi tank and led into septic tanks for disposal on land for farming The waste water of Malleswaram, was similarly led into septic tanks constructed on the link road between Malleswaram and Seshadripuram and the effluent used for cultivation purposes These tanks have since been shifted about a mile lower down in the valley

As it was high time that a comprehensive scheme of drainage on up to date lines under water carriage system, should be prepared and kept ready to be adopted at the earliest possible opportunity, Mr D Cruz who had considerable experience of drainage work in the City of Mysore under *The City Improvement Trust Board* was appointed to prepare a detailed scheme of drainage for the City including the extensions The comprehensive scheme prepared by Mr D Cruz in 1917 provides for underground sewers in the old town as well as in the extensions, replacing the slabbed drains in the former, and partly open and partly underground drains in the latter

The old town is founded on a broad gently sloping valley convenient for one common drainage, while the extensions have come up on very rough country round about and very inconvenient for draining into one outfall Since the old town and the extensions combined form the city unit, a comprehensive drainage scheme does not admit of one common gravity outfall, for the disposal of the City s sewage as a whole A long ridge line passing almost North and South divides the City into two main areas East and West Each of these areas is again traversed by a series of subsidiary ridges and valleys making the physical features very uneven The different valleys on the East, meet the Dharmambudhi Koramangala valley which forms the main drainage on that side, while the several valleys on the west do not all combine to form one common drain If a common outfall for the whole of the City is to be provided a pumping scheme becomes unavoidable In Mr D Cruz s scheme barring a few cases, the sewage of every other portion was proposed to be pumped to one outfall at the Sunkal Farm The pumping system proposed was the Shone s Ejector system worked by compressed air, supplied by a central air compressor station, and conveyed through pipe lines connecting it with each of the ejectors

For want of adequate water supply, no provision was made in Mr D Cruz s scheme for water closet system, nor any treatment and disposal proposed for the sewage beyond sewage farming, which is being practised for a long time past in the City

The complete scheme was estimated to cost about Rs 20,00,000 It was not possible either for Government or for the Municipality to arrange for financing the scheme at once, or in the near future Moreover the water supply was defective Due to these reasons the scheme was allowed to lie over

In the meantime the City was being improved and extended and all amenities were being provided Its enviable climate was attracting numbers of visitors from far and near Augmenting the water supply and providing proper drainage were the items overdue

Very soon after the present Dewan Sir Mirza M Ismail, took office, the question of drainage was again taken up in 1927 The scheme was subjected to the scrutiny of experts to ascertain if the proposals were sound and if the estimate required any revision in the light of the lapse of ten years time

Mr J Bhore the then Chief Engineer of Mysore examined the scheme and he disapproved of the idea of having one outfall and of pumping sewage from each of a series of adjoining valleys as unsuitable to our condition, as it involved the Municipality in heavy expenditure, both capital and recurring He condemened the Shone s Ejector system which was beginning to give trouble in Bombay, and which is not being used there at the present time

Sir M Visweswaraiah agreed with Mr Bhore, in regard to the number of out falls His opinion is that having one outfall for the City would be an ideal arrangement Since pumping of sewage from the several drainage areas into one valley, would be costly and beyond the financial capacity of the Municipality, he recommended the idea of disposing of the sewage in their respective outfalls as expressed

by Mr Bhore until the Municipality finds itself in a position to meet the heavy maintenance charges of the pumping system when there could be one outfall

Mr Marker expressed the idea that pumping would be very costly but that having one outfall would be preferable to having several The reason adduced by him for the latter opinion is, that since the Municipalities in Mysore and Bangalore were not able to look after even one or two outfalls, much less can they be expected to maintain several outfalls This, however, does not appear to be a cogent reason

It was emphasised in Mr Bhore's Note, that water supply is the first necessity for a drainage scheme which should succeed and not precede the water supply improvements As the Thippagondanahalli project was under progress in 1930, and the scheme required revision, further consideration was deferred till the completion of the Thippagondanahalli project This was completed in 1934, and additional water supply to the town was rendered possible, thus removing one main obstacle in the way of the introduction of the drainage scheme The Municipality also was earnestly taking steps to provide finance—the other main obstacle, to the extent of its capacity Laying of pipe drains of the full drainage scheme has already proceeded piecemeal here and there in the city, and the sewage is discharged into the open storm water drain As this method was not satisfactory it was found imperative that intercepting pipe sewers should receive the contents of the street sewers and discharge at selected spots outside the town The laying of the main intercepting sewers should have taken precedence over the collecting system within the town, but the operation has, however, been reversed, to a certain extent for reasons which need not be discussed here

The main intercepting sewer line on Sunkal Valley was estimated for, sanctioned in 1935 and laid as a first step as far as the Sunkal Farm, the work having been completed by July 1937 The street sewers and sub mains that are now being laid are connected to the main intercepting sewer and not to the storm water drain, though the sewage is now finally dropped into the latter as a temporary measure

4 The Comprehensive Scheme

No revised comprehensive scheme for the City has been prepared since Mr D Cruz's time to give an idea of what the drainage scheme would ultimately cost, under the present conditions

For preparing the comprehensive estimate, definite orders were not available as to whether there should be a single outfall for the whole city having pumping arrangements with all their implications, or whether the sewage from the different valleys, may be disposed of, in the respective valleys Orders were received in July 1938, to proceed on the basis of different outfalls, and the scheme that is submitted has been accordingly prepared

5 Details of the Scheme

The scheme consists of the following —

1 The outfalls *i e* the places where the sewage of the drainage areas is proposed to be finally discharged

2 The main sewers *i e* the largest mains which receive the sewage of the interior of the town and discharge into the outfalls These commence at the end of the collecting system and end at the place of treatment and disposal

3 The street sewers the sub mains and intercepting mains each receiving the sewage of the other in the order mentioned and together known as The Collecting System

4 House connections

5 Flushing arrangements

6 Public conveniences

7 Treatment and disposal

1 Outfalls

1 The Koramangala outfall, draining almost the whole of the old town, except a very small bit near Goods' Shed but including the area round about the Public Offices, part of Basavanagudi, to the East of the ridge line, and the whole of Visweswarapuram, Mavalli and all that area of Richmond town, Langford town, and Nilsandra in Cantonment limits which drains into this valley

2 The Magadi Road outfall for the areas comprised in the extensions of Malleswaram, Seshadripuram, Palace Guttahalli, Venkatarangapuram and the High Grounds

3 The Kempambudhi or Chamarajpet outfall, to serve the remaining portion of Basavangudi to the West of the main ridge line, the Gavipur Extension, the Shankarpur extension and all that portion of Chamarajpet draining towards the Kempambudhi tank

4 The Channammanakere tank outfall for the disposal of the sewage of the South West corner of Basavangudi extension, the New Narasimharaja Colony and future extensions in that region

The Gavipuram Guttahalli extension, which is immediately on the margin of the Kempambudhi tank cannot be connected by any means except by pumping, to the main line serving the third or Chamarajpet outfall, as levels do not permit this being done The main line for this outfall had been laid long before the birth of the extension and runs at a much higher level than the lowest point there This small extension is very inconveniently located on the top and sides of a ridge which separates two small contiguous valleys, draining towards the tank and the sewage of houses do not easily admit of being collected in one pump pit either in one valley or the other for pumping It looks as though each valley requires an independent pumping unit If this is to be avoided, Kempambudhi tank has to be breached and separate line laid to meet the main sewer

Similarly, Buttfire Field Reserve Police Lines, Goripalya, Palace Upparahalli and Munireddipalya, situated on different valleys, do not admit of being taken into any of the main outfalls noted above These may be classed under '*Undeveloped areas* to be considered each independently after the completion of the works in the other portions of the City A lumpsum provision is made in the estimate for providing sewage system in these areas Munireddipalya and Palace Upparahalli which are cut away from the City, can best be taken up along with the Cantonment drainage scheme when it comes But a separate estimate for laying pipe sewers and disposing of the effluent from the septic tank is however prepared for Munireddipalya This cannot be done for Upparahalli as it drains to Millers Tank in Cantonment limits The peculiar topography of this City, with its several ridges and valleys, renders it impracticable to combine the sewage of the several parts of the whole City or dispose it of even in a minimum number of outfalls, without going in for the very high cost of pumping from several valleys

2 Main Sewers

For purposes of determining the sizes of the main sewers, the figure for population taken is 2 80,000 which may be expected to be reached by 1951 *i e*, about 12 years later This year s population is computed to be 2,17,500 and it is expected that it will be about 2,30,000 in 1941 On this basis the figure is roughly calculated to be 2,50 000 in 1951

Water Supply —The quantity of water that is now being supplied is in the neighbourhood of 3¼ million gallons a day which works out to a little over 16 gallons per head of the present population As all connections are being metered, the consumption may be taken at the same figure of 16 gallons per capita even in the future and this gives about 4½ million gallons per day, for a population of 2,80,000 in 1951

The sewage discharge for the purpose of designing the sewers is generally taken as equivalent to the amount of water supply consumed by the community But in practice all that amount used for gardens and lawns, road watering, etc , which is included in the rate per capita consumption will not find its way into sewers Thus the discharge in the sewers based on water consumption ought to be less than the rated consumption There are, however, areas where water from wells are used. These and some amount of subsoil water and rain water from courtyards of houses will go into the sewers

In calculating the size of the main sewers already laid in the Koramangala valley, 40 gallons per head are taken as the maximum flow of sewage per capita, per day and the population as 2,25 000

On this basis, and on the assumption that there will be only one outfall for the whole town the sewage from all other outfalls being expected to be pumped to one valley, the size of the main has been designed to have a carrying capacity of 16 66 cusecs or 9 million gallons per day Since the present scheme does not contemplate pumping of the sewage from a series of adjoining valleys to one outfall and since the actual consumption of water works out to only 16 gallons per head, this size

will be more than ample for future requirements for a long series of years to come, and for further extensions, in this valley The area draining to Koramangala valley at present is about 5 square miles or 3,200 acres Out of this 1 2 square miles or 768 acres represent the thickly populated city portion

The old town is so very much overcrowded that it may be safely assumed on the basis of the area and density of population in 1891, that the density of popula tion even now is roughly 100 per acre in this area This works out to a population of 76,800 for this old portion of the City The population in the rest of the inhabi ted area *viz*, 3 8 square miles or 2,432 acres in this valley will work out to 48,649 at the figure of 20 per acre which is the rough average for the rest of the City, for determining the per capita sewage discharge in the Koramangala valley The total population will be 76 800 plus 48,640 or 1,25,440, granting that the sewage flow will be 40 gallons per head, assumed in designing the main sewer, it works out about 9 3 cusecs for this population and consequently there is still a margin of 7 3 cusecs in the capacity of the main which is a reserve far more than sufficient for future extensions in this area Since, however, the water supply consumption is working up to 16 gallons per head, we may assume not more than 25 gallons for our purpose, allowing for all contingencies such as additional water used from wells, storm water from courtyards of houses, etc, and this works out to 5 8 cusecs discharge, while the capacity provided is 16 6 cusecs Thus the size of the main outfall now laid, is far more than is needed now and for a long time ahead of now The pipes in this valley are of cast iron of sizes varying from 15' to 30" in diameter up to the new Kumbaragundi Road and beyond that, the sewer is built up of rein forced cement concrete construction of ovoid section The gradient of the sewer follows more or less the gradients of the streets and varies from 1 in 300 to 1 in 700 and the velocity provided is from 4 16 to 3 26 which is a little more than is required for giving a self cleansing velocity The velocity generally recommended is 2 per second minimum and 4 per second maximum for large sewers

Cast iron pipes are used as the sewer had to be laid in deep cutting of 11 and above and stoneware pipes may not stand the pressure due to this depth To give house connections in the streets where cast iron pipes are laid, rider mains or sewers of stoneware pipes are provided for

Malleswaram Outfall – The total area draining into the Malleswaram main within the Municipal boundary is 4 55 square miles or 2,912 acres The present population of this area as distinct from that of the whole city can be easily ascertained

It is shown under Koramangala outfall, that the City portion itself has an area of 768 acres with a density of over 100 per acre The remaining area within the Municipal boundary gives an average density of less than 20 persons per acre

We may take for purposes of calculation a per capita discharge of 25 gallons per head per day though the water consumption of all metered water supply connection is working out at 16 gallons per head per day On this basis, *viz*, 25 gallons of discharge, the total output of sewage works out to 2 7 cusecs, while according to the discharge statement the main provided is capable of taking a discharge of 4 98 cusecs flowing *half full* Thus the capacity provided is more by 2 28 cusecs, which is equivalent to a discharge from an additional population of 50,000 persons The size of the main *i e*, 21 inches diameter provided is therefore more than adequate

Kempambudhi Outfall —The area draining into this valley is 1,376 acres approximately with an average density of about 20 per acre At 25 gallons discharge per head per day as assumed in the other outfall, the maximum discharge is 1 37 cusecs, while the discharge which the main is capable of taking is 1 81 cusecs flow ing *half full* There is thus a margin of 0 54 cusec, equivalent to a discharge of sewage from an additional population of 11,000 persons

Channammankere Outfall —The area draining to Channammankere outfall is just developing and there is likelihood of more houses springing up in this outfall area which amounts to 100 acres at present Taking a density of 20 persons per acre, the population to be provided for will be 2,000 The sewage discharge at the same figures of 25 gallons per head per day will work out to 0 09 cusec The capacity of the main provided is 0 626 cusec *flowing half full* There is thus a margin of 0 536 cusec which provides for an additional population of over 10,000 as the area develops

STATEMENT SHOWING THE POPULATION, SECTION OF MAIN, DISCHARGE, ETC, PROVIDED IN EACH OUTFALL OF BANGALORE CITY

	Name of Outfall	Area in acres	Population	Ds at 25 gallons per head in c ft p r sec	Siz of main	Ds thro ma n flow ng half f ll	Excess pro vided a e d ffce of cols 6 and 4	Remarks
1	Koramangala Outfall	768 acres at 100 per acre 2 432 at 20	76 800 48 640 1 25 140	5 8	2 8 x4 07 and 3 0 x4 6 following ⅔ full	16 72 and 23 07	10 8(	Corr ponds to a d charge due to an add t onal populat on of over 2 00 000
2	Malleswaram Outfall	2 912	58 240	2 7	21	4 98	2 28	Do ,0 000
3	Kempambudhi Outfall	1 376	27 420	1 27	1	1 81	0 54	Do 11 000
4	Channamman kere Outfall	100	2 000	0 09	9	63	0 54	Do 11 000

N B —Water s pply works out to 16 ga lons per head of population For purposes of sewa e d scl rge a rate of 25 gallons per head is a med

The collecting System —The main sewers are thus already laid in the first three outfalls mentioned for some distance and the collecting system has been worked upwards from the obligatory levels of these mains These consist of (1) street sewers or lateralas laid at such a level in each street as to command the outlets of houses on either side of it, and (2) a number of submains which collects the contents of a number of street sewers and finally discharge into the main sewer in each outfall

All the proposed street sewers, sub mains and intercepting mains, consist of glazed stoneware pipes and specials manufactured in the Mysore Stone Ware pipes and Potteries, Ltd , near Soldevanahalli The only exception is the intercepting main in the Koramangala valley which consists of partly cast iron pipes of Bhadra vathi Iron and Steel Works, and partly of R C construction

For street sewers, the minimum size adopted is the 7 S W pipe as this is found by experience, the most suitable size

The sub mains are mostly of 9 pipes except sub main No 5 across Sri Nara simharaja Road where the size provided is 12 for a short distance at the end

The streets in the several areas traversed by the collecting systems have fairly good gradients in one direction or another, and this natural facility has helped in providing adequate slopes and self cleansing velocity in the sewers The velocity provided, varies between 2 50 and 5 21 feet per second, while the minimum self cleansing velocity in these may be 2½ per second In connection with the collect ing system the following facts are brought to notice

In the old town the spaces in between the several main and cross roads have been filled up anyhow with houses closely built up on either side of narrow winding lanes and bye lanes the number of which is too many These have since increased after some of the more congested sections have been opened out, and the whole area is a regular maze Their total length is far too much for the area, for purposes of drainage Also, sharp kinks and too many windings have necessitated the provision of a larger number of manholes than would have otherwise been required Many of the narrow lanes are again traversed by water sub mains and house connection pipes, electric lighting and telephone cables, covered slabbed drains and disused filled up wells All these impediments have to be overcome in laying the pipe lines and these have added considerably to the cost of the scheme

Since Mr D Cruz prepared the drainage scheme in 1917, the city has grown by the addition of further extensions, and blocks of houses, to wit, Venkataranga puram, Sripuram, Srirampuram and the Subedar Chattram Extension on the Malleswaram side, and the Gavipur Guttahalli Extension and Narasimharaja colony on the Basavanagudi side More extensions are again in the course of formation and are to come up sooner or later

A regular survey of all the new extensions and blocks of buildings as have already come into existence have been made and incorporated into the plans of the various drainage areas in connection with this scheme

A few observations on the layout of extensions to the city and on the manner in which the houses are coming up seem to be necessary here

Private owners of revenue land bordering on the city limits are permitted to have their own layouts for small extensions The plans presented for approval are drawn on plain paper, independently of the adjoining built areas and without reference to the ground contours showing the actual lie of the country The result of such layouts without reference to the contours of the ground will be steep gradients, deep cuttings and deep manholes for sewers, unnecessary drops and difficulty to control the velocity in the sewage and storm drains Besides, these applications for private layouts come in bit by bit, and it will be found rather difficult to fit in each of these layouts piecemeal with the existing built areas and to arrange a comprehensive drainage scheme, especially if the layouts are proposed on separate valleys Every portion of the city or at least that portion of it which has one common outfall is dependent on every other portion of it, and consequently no single portion can be considered independently without studying its relationship to other portions of the town This comprehensive study of the layouts with reference to ground levels and to their inter relation with the adjoining built areas is not possible, if the layouts are left to private individuals, whose main lookout is to speculate and make as much money as possible after satisfying the conditions of the Municipality and payment of betterment charges In many cases the sites are of various dimensions, purposely made so, with a view to have as many sites as can conveniently be squeezed into the layout, to get the maximum return possible, though there is a Government Order fixing the smallest size of a site in the extension as 60′ × 40′

The disposal of the sites again depends upon the demand there is, from the prospective house builders, and upon the willingness of the owner to part with them at a reasonable rate Also, sites are sold not in the order in which they are marked but in bits, some here and some elsewhere, according to the choice of the purchaser so that sites built upon are scattered with intervening vacant sites, which will remain so for long years for want of any enforcible provision fixing the period within which houses have to be constructed In the system under notice, no stipulation can work as the speculator has to wait as long as possible before he can sell the sites in order to get his return, purchasing as he does from a private party, the buyer is under no obligation to construct a building within a fixed period He may put up a building at his own convenience or he may in his turn speculate and dispose of the site at a most favourable opportunity

Having permitted the layout, the Municipality has to arrange for water supply, drainage, lighting and all other Municipal services for the sake of a few houses in a slowly developing area, and under adverse conditions Otherwise the sanitation of the area will suffer

Again the houses are built in all manner of ways without any eye towards æsthetics One residential building on one site, the frontage of the houses in one line, the construction of low compound walls or railing in front so as to give a fine vista, are all points which if enforced when issuing licenses, go a great way towards improving the appearance of the extensions Insistence on the presentation of plans, elevations, etc , from draughtsman experienced in fine building drawings, duly licensed on payment of fees by the Municipality will be useful in the creation of beautiful additions to the town with nice looking houses

So long as the layout of extensions are left in the hands of lay men, the defects pointed out are sure to continue If the Municipality were to take up the creation of extensions by its own agency, things are sure to improve as they will be enabled to spring up in an orderly manner with proper technical supervision This subject of extensions and town planning by municipal agency is a big one and will have to be dealt with separately

The point which may be desirable for the Municipality to consider and come to a decision is whether in the formation of future extensions, conservancy lanes may be avoided in view of the existence of proposals for providing underground drainage in the adjoining parts and provision for its continuation in the proposed layout There are decided advantages to the Municipality in doing away with conservancies If decision to this effect is taken, it may be necessary to fix the minimum sizes of sites so that sufficient open space, however small, may be left within the site to lead the sullage water from the house outlet to the street sewers

4 House Connection

These are pipe lines conveying the sewage from the outlets of houses to the street sewers The pipes are of glazed stoneware, usually of 4″ diameter

It has been the practice on previous occasions, to provide for one connection to be given to each house, the cost of such connection being included in the main estimate for laying the sewage system On this precedent, a similar provision has been made in the several estimates for street sewers in the scheme under report Instructions were subsequently received that house connections have to be taken invariably by the property owners at their own cost The total amount of the estimate will thus get reduced by the amount of such provision, *viz*, about four lakhs of rupees on the whole

In respect of house connections the following points deserve particular mention

That house connections have to be given at the cost of house owners is the principle recognised in the West from a remote past But conditions in this country are different Owing to the financial incapacity of the vast majority of owners in our towns, progress achieved in respect of house connections have always been very slow though the Municipal authorities are doing their best to compel the house owners to connect their outlets to the sewers where they are laid

The apparent reluctance of many owners of property to have their house drains connected is due to the estimate presented by the licensed plumbers which they consider as costly If a number of scattered outlets of the same house have to be connected separately, the cost will be all the more, and no wonder that the owners feel the pinch and put off sewer connections as long as possible The cost however can be considerably cut down if the outlets are connected into one internal drainage and the sewage passed—through gratings to arrest floating matter—into the house latrines connected to the sewer with a gulley trap Even the squatting pan can be made of cement concrete and smoothly plastered over so as to reduce the cost and yet be efficient in working Many of the houses have every facility for such an arrangement and numbers of such have already been done much to the satisfaction of the residents In fact, the arrangement is so convenient and cheap, compared with closets fitted up on western model, that even enlightened gentlemen have adopted the method as being efficient in working, cheap in first cost, and requiring little or no maintenance This method enables all the waste water from washing and from bathing rooms, to flow through the latrine into the underground sewer instead of the open surface drains, and incidentally become useful in continuously flushing the closet Again, the visitor to the closet will generally always take water in a bucket, about a gallon in capacity After washing, if he simply throws the remnant water in the bucket with some force into the gulley trap in the squatting pan the floating matter will get flushed inside the sewer immediately The procedure will also solve the problem of water supply for flushing, about which there is such an amount of outcry The public generally are not aware of this simple method There are many plumbers in the City, who taking advantage of the plight of people who are served with notices by the Municipality, prepare estimates in such a way as to utilise as much of the sanitary wares as they have in stock and it does not pay them to recommend cheap construction

A good deal of propaganda is required It is only the Municipal Agency that can do this if the responsibility of making the people of all sewered areas to take up house connections, as rapidly as possible, is thrown on some of its employees

It is found by recent experience that the work of the licensed plumbers requires municipal control and supervision After getting licenses as per rules, the plumbers set about the work and complete it before there is any time for final inspection by the authorities it is even stated that licenses are taken for the construction of latrines as well as the main building simultaneously, and the plumbing work got done by unlicensed building contractors who rarely do works of this kind and who have no experience in the line The result is that works are not done efficiently and there have been complaints from the house-owners of bad work and from the Department of bad handling of sewers

Until the house connections are completed it seems desirable to depute an official experienced in sewerage work, to work under the Health Officer who is now issuing the licenses He should have no other work but this, when he can be held responsible for any bad work on the part of the plumbers As it is not possible for the latter to keep the work open for departmental inspection for any length of time in a crowded city like this the supervising official must be spared extra work When all the houses are connected, he may be given any other work

A few words are necessary about the existing daily conservancy latrines in the City Many of them are provided with trap doors opening into the streets frequented by the public, when one passes along these streets, especially in the interior of the town, one is confronted with the disgusting sights of innumerable trap door latrines, some with shutters in fact, a good many with broken coverings, and a few with no door at all Even if the contents are arranged to be removed daily, the flooring is not cleaned and the matter will be soaking into the ground attracting flies and vermin It is possible that such a state of affairs will be responsible for many intestinal diseases in the neighbourhood

It may be mentioned that in old Bangalore, many houses contained pit latrines These consisted of shallow wells with stone lining and covered over with slabs, with a slit left Everyday's refuse of the houses including ashes, sweeping, etc, used to be dumped in, and at the same time used as a latrine No water except that used for washing purposes was being added In six months or a year the contents would become good manure or what may be termed *compost* and the raiyats from outlying villages would purchase the same for money or for kind, which consisted among other articles even clay for repairs and renewals of mud roofed houses. This method though old and far out of date to tolerate at the present time, was not such a nuisance to the public as the trap door system

It is therefore desirable that a regular campaign is started against this type of latrines, especially in sewered areas and that all of them made to be converted into flushing types within a reasonably short time

Where there is no sewer line laid yet, an *oven* type of latrine will be far better because it ensures the ground being washed and cleaned after the matter is removed as otherwise the owners will find fault with the remover In order to get his wages regularly, the scavenger will worry the inmates to serve him with water for cleaning the grounds

5 Flushing Arrangements for Sewers

These are for periodically flushing the sewers to wash any matter that may have been deposited when the discharge in the sewers is low Since our sewers are given very good fall, such deposits may be very rare Special devices for flushing with filtered water will be very costly Arrangements are made, however, to flush the sewers with waste water of public taps situated at the head of several of the street sewers Where possible, the waste water from the taps flowing in small quantities will be made to accumulate in a manhole where a syphon is erected for discharging a mass of water into the nearest manhole on the sewage line, from time to time as the water accumulates in the syphon

6 Public conveniences

These are water closets provided for use by the public in any town of importance in connection with sewerage schemes A lumpsum provision of Rs 15,000 is made in the scheme for the construction of urinals and lavatories later, after fixing the position where they have to be built In the city, the Municipal Council have already built a number of public urinals and lavatories with flushing arrangements These are required in places much frequented by the public such as markets, theatres, business centres and generally here and there throughout the town for the use of passersby In the city, they are now required even in residential areas especially in the old town which is overcrowded as most of the houses are let out for tenemental purposes for more families than one It is observed that many houses hardly contain even one latrine while they are let out for two, three or more tenants At least one for each family is necessary, and in their absence, drains, lanes and culverts will become public latrines and no Municipality will be able to maintain all the cleaning establishment required to meet such conditions nor can the Municipality afford to construct the number of public latrines required for all the residents as well as outsiders People very often either do not make use of or misuse public conveniences if only one or two are provided In residential areas, latrines at one for each family in a house, will to a great extent prevent commission of nuisance all round, and if the Municipality were to take power to compel each house-owner to provide privies at one unit for each family in a tenement house, the commission of such a nuisance may to a great extent be controlled A smaller number of public lavatories will then be required here and there in the

interior, for use by the people other than the residents of the area, who may happen to pass that way

7 Treatment and Disposal

This is the most important portion that has to be settled at the very outset before action is taken to get details of any drainage scheme In reference to the scheme for this city, the places of disposal of sewage have now been settled Being an entirely inland town without any large sheet of natural water, such as sea or river for disposal by dilution as is mostly done in western countries, there can be no method of sewage disposal for Bangalore, other than that on land as is being already done to a certain extent here and to a great extent in Mysore City It is only the question of treatment of sewage prior to disposal on land that is to be decided

In western countries, most of the towns of any importance have sprung up on river bank or on the sea coast The sewage of these towns has ultimately to be let into the river or sea, as the case may be It is obligatory on the part of the town authorities there, to purify the sewage effluent reaching the waterway to the greatest possible extent, to ensure safety to fish life and safeguard the health of the people who happen to use the same water lower down for town water supply, and of people who use the marginal grounds and water for swimming, boating and other recreational purposes Thus their main concern is how to purify the effluent to the utmost extent to satisfy the standard of purity set up by law

Bangalore City is under no such obligation beyond what is considered desirable to avoid public health hazard and prevent nuisances and the question is what degree of purity is necessary in the case of Bangalore, where the place of disposal is land and only land, to ensure safety to public health Is such a high degree of purity as is required to prevent stream pollution to be given to the effluent here, which is to be used on land for sewage farming?

In the West again, the purification of sewage is effected by several methods, such as settling the sewage and subjecting it to septic action in septic tanks or passing through trickling filters or chemical precipitation or aeration by the Activated Sludge Process The selection of the particular method depends on the minimum standard fixed as necessary for the place

The sewage of no one town is similar to that of any other town in point of strength quantity, hourly or daily flow, and consequently no town can copy wholesale what is adopted in any other town But this subject of sewage treatment and disposal is being studied in the West from a long time past and several methods put forward as having satisfied one community or another, and thus there are some methods at least to choose from, in that part of the world, for any town that wants to have a sewage scheme We cannot copy what has been done in those countries without comparing our conditions with theirs

'It may seem a commonplace to remark that the principles of Engineering Science are the same no matter in what part of the world they may have to be applied In the East, the Sanitary Engineer has to confront factors peculiar to the scene of his operations, and relating to material, labour, meteorological phenomena, not to forget social and religious prejudices sometimes of any uncommonly perplexing nature To be able to solve satisfactorily all the drainage problems of the East, an Engineer must have lived for the best years of life in the East and have handled them *in situ*

In India, we have no such studies systematically undertaken anywhere to guide us and we cannot adopt wholesale the disposal arrangements now adopted in Bombay, Poona, Hyderabad, or Madras, as has already been set out in greater detail in my report, submitted after visiting those places

Briefly stated, Bombay is treating only a portion, about 1/10th of the total discharge of sewage by the simplex type of Activated Sludge Process leaving the effluent to the sea and using the sludge after digestion for filling marshy areas making use of part of the sludge gas and burning the rest On account of the cost involved, it has not yet been settled as to what is to be done in the way of treating the remaining 9/10ths of the total flow which is now pumped into the sea without treatment

Poona is simply pumping practically the crude sewage, without treatment to the canal area, as a rich manure for broad irrigation specially *Sugarcane*

Hyderabad has employed the simple method of preliminary settlement of sewage and passing it through septic tanks utilising the effluent mixed with canal

water for irrigation of sugarcane, paddy, and other crops and selling the sludge periodically removed from these tanks, as manure to owners of garden lands

Madras has yet been doing nothing in the way of sewage treatment

It seems as though we at least are better off in this respect as we have got the example of Myore City, the pioneer in many ways in regard to sanitary and other improvements, in that we have a simple method of disposal of sewage on land and a sewage from which is yielding a substantial revenue

Bangalore has to select one or the other among the following methods of treatment of wagere

1 *Activated Sludge Process* —This type requires a somewhat large capital outlay more atention than other methods and highly trained men It has more mechanical and complicated equipment requiring power for working, which increases maintenance cost

2 *Mere settling and passing through trickling filters* —This is done to purify the effluent before discharging into a river for dilution

3 *Settling by aid of chemicals* —This is said to give a better clarification to sewage and is said to be adopted more as a seasonal treatment during summer when the river flow is not enough to give the required dilution to the eriuent which has passed through trickling filters only

In this, it is the cost of the chemicals that counts Whether this degree of clarification is necessary for the effluent that has to be used for sewage farming and as a fertiliser as well, is a point that has to be considered in regard to chemical precipitation method

Again there is the question of disposal of the sludge "Sludge is sometimes used as a fertiliser, but its chemical fertilising value is somewhat less than that of commercial fertiliser It is especially satisfactory as a top dressing for lawns, because it contains no seeds of weeds In a few large plants, sludge is made into a general fertiliser by grinding, screening, and sometimes by the addition of other ingredients and then sold in bags or in cart loads

The question of compost making with the sludge has to be decided by the Municipality, referring to my detailed report on the subject of making compost in Mysore, in connection with my visits to the places mentioned above It is also largely a question of financing by the Municipality on the organisation required for compost making

4 *Settling in preliminary and septic tanks and utilising the effluent for sewage farming* —This in effect is downward filtration through land

This is a simpler method than others but from the public health point of view, the method is not up to date and is not considered a satisfactory treatment

Experiment on chemical precipitation method of treatment is being carried out for Bangalore sewage, under Government Orders The result of this experiment will be awaited If it proves satisfactory as regards extent of purification, removal of health hazard, and financially also, the method has a chance of consideration as being the next alternative to Activated Sludge Process

Finally, the adoption of one or the other method of treatment will depend upon the extent to which the Municipality is prepared to finance towards construction and maintenance

"Good Engineering Practice demands that the design for sewage treatment plant shall be such that the sewage will be treated to that degree which will satisfy all the requirements of the given case and no more'

Since the chemical precipitation experiment is still being carried out, no estimate of the cost of providing structures and appliances for this method could be prepared

The works that will be necessary for any other method of disposal that is decided upon requires a good deal of care, experience, and forethought

In the estimate, a lumpsum provision of Rs 8,00,000 has been made for treatment works pending final settlement of the method Acquisition of lands for the final disposal has been separately provided and the amount provided is Rs 4 crores If chemical method is not finally sanctioned, we have to fall back upon our Mysore City experience or adopt the Hyderabad system with any modification that may be deemed necessary to suit our conditions

Any method that will have to be adopted will depend upon the question of finance An Engineer cannot say that he will give the best scheme that he considers necessary and that finance is no concern of his

" Financial limitations imposed upon the Engineer will often restrict his choice of solutions and especially the extent of immediate construction '

" The cost of sewerage works is a subject presenting many pitfalls to those without experience and *even to those having it*

" The subject (Treatment of Sewage) is one of the most disputed features of sewerage today, it is destined to concern many cities vitally and to involve them in enormous financial obligations if the advocates of compulsory sewage treatments have their way The Sanitary Engineer who neglects to work for the best interest of the public health, falls short of the full discharge of his professional obligations, but it is wise to keep in mind a fact stated as follows by *Engineering News* — ' We know of many instances in which business men distrust Engineers and pin their faith to so called *practical* men largely ' because of unfortunate experience with Engineers who appeared to think that the question of cost was no part of their concern

The total amount of the present scheme works out to Rs 41,25,141 as per the general abstract enclosed for reference

N KRISHNIENGAR,

Special Officer,

Bangalore City Drainage Division,

Bangalore

Bangalore City Drainage Division—*concld*

Items of work	Amount		Remarks
	Rs	Rs	
(4) Laying a sewer line for High Ground Area for West End Hotel	10 500		Estimate submitted for sanction now
Total		6 27 300	
V MUNIREDDIPALYAM			
I Laying main and street sewers in Munireddi palyam	35 000	35 000	Estimate submitted for sanction now Best taken up along with Cantonment sewages
VI PUBLIC CONVENIENCES			
Constructing Urinals and Lavatories etc	15 000	15 000	Estimate submitted for sanction now
VII SURVEY CHARGES	4 000	4 000	Estimate submitted and worked out for Rs 2 000 Rs 2 000 more required
VIII Surveying and Mathematical Instruments	1 500	1 500	Do do
IX Laying sewers in undeveloped areas	1 77 971	1 77 971	Estimate submitted for sanction now
X DISPOSAL WORKS—*For all outfalls*			
I Treatment works (Simplex Activated Sludge Plant) as per quotations received from Messrs Dunkon Stratton & Co Bombay for Koramangala Valley	8 00 000	8 00 000	Lumpsum Estimate submitted for sanction now
Total	45 65 000	45 65 000	
Deductions			
1 Deduct amount provided in the above estimates for house connections (as per instructions recently received)	4 39 859	4 39 859	
Balance	41 25 141	41 25 141	
Details of the balance			
Amount of estimates sanctioned from time to time to date	9 94 846		
Amount of estimates to be sanctioned	31 30 295		
Total	41 25 141		

WD 3985—GPB—100—8 9 40

1 Serial No	2 Item no in the scheme	3 Name of work	4 Estimate	Outlay to end of June 1945

Balance req to complete work	Savings	Excess	Remarks
6	7	8	9

I Main outfall (Koramangala Valley)

1	Laying main sewer line along Sultanpet, Arcot Srinivasachar Street, Gundopanth street, and along the Main storm water drain upto Sunakal farm	2,10,200 (Revised)	2,08,823-6-1
2	Laying No 1 Sub Main in along Avlepet Taluk Cutcherry Road and Akkipet Road, and join the main -	24,000	22,055-12-0
3	Laying St sewers of No 1 Sub Main in Akkipet & Cottonpet areas forming portions of 2nd & 3rd Divisions	76,680	77,917-0-9
4	Laying Sub Main No 2 from Jail Extension along Subedar Chathram Road and Balepet & Joined to the main, forming portions of 2nd & 3rd Divisions	26 876	26875-12-0
5	Laying St Sewers of No 2 Sub Main, Balepet area forming portions of 2nd & 3rd Divisions	43,475	43,285-14-5
6	Remaining St Sewers of No 1 Sub Main & No 2 Sub Main along Akkipet and Balepet areas forming portions of 2nd and 3rd Divisions	60,420	23,361-6-9
7	Laying St Sewers of Ramakrishnapuram Extension, forming No 2 Division	~~15,600~~ 10,061 (modified)	11033-7-0
8	Laying St Sewers of Jail Extension forming No 2 Divisions	12,300	—
9	Providing a Rider line to No 1 Sub Main on a portion of main to receive house connections in the area of Avlepet Sultanpet & Gundopanth St. D No 5	~~7,600~~ 4985 (Revised)	4589-4-0
10	Laying Street Sewers for High Ground Area forming the 1st Division	10,000	—
11	Laying sub Main No 3 with its connected street sewers (CC) Chickpet area between Kempe Gowda Road and Sultanpet Road, forming portions of 2nd and 3rd Divisions	1,90,500	1,35,038-8-8
12	Laying Sub Main No 4 & 4A with its connected street Sewers between Sultanpet road and Mysore Road, and between Avlepet Road and Market Road, forming 3rd Division	2,30,000	1,50,971-12-2
13	Laying Sub Main No 5 with its connected St Sewers (CC) area adjoining Avenue Road between District office Road and Gundopanth Road, forming portions of 2, 3, 4 and 5 divisions	93,300	74,850-13-8
14	Laying No 6 Sub Main with its connected street sewers between District office Road and Narasimharaja Road, forming portions of 4th and 5th Divisions	88,340	88017-10-0
		10,81,137-0-0	86,6820-14-6

15	Laying No 7 Sub Main with its connected Street Sewers between District Office Road and Naralimaraja Road, forming and 4th and 5th Divisions	1081,137 1,41,938 ~~93,900~~ (Suppl Est)	8,66,828-11-6 98,143-7-11
16	Supplemental Estimate to No 5 Sub Main etc for areas which were omitted	36,500	Vide 13
17	do do do to No 6 Sub Main etc for areas which were omitted	43,000	Vide 14
18	Street Sewers of Fort area and portions draining direct to Main Sewer, (i.e) Fort area round about Maralle Rama Rao's street and Block Nos 21 & 22, forming portions of 7th and 8th Divisions	72,100	29140-10-3
19	Supplemental Estimate to No 7 Sub Main etc for ~~areas~~ areas which were omitted (Public IV & V Division)	~~48,038~~	
20	Improvements to Sub Main No 8 with its connected Street Sewers (i.e) Eastern portion of Basavana gudi, Kalasipalya, Korachapalya, and Bamboo Bazaar forming portions of 6th and 7th Divisions	2,25,000	1,32,760-9-11
21	Laying Sub Main No 9 along Krumbregal and Lal Bagh Roads	60,000	33 559-3-2
22	Laying Street Sewers of 9th Sub Main for Basavanagudi, Uppara halli, and Maralle, forming portions of 6th and 8th Divisions	1,79,000	1,28,666-10-0
23	Linking the Sampige Tank area with the Main Sewers 4th and 6th Divisions	13,000	
24	Leading the sewage from the present terminal of the ovoid Sewer to the Septic tank at Sunakal Farm and further on to the open storm water Drain	12495 ~~23,500~~ (Modified)	12494-12-7
		18,54,170	12,99,586-0-18

0-13

5501-14-5 Rs 5250/- was contributed by West End Hotel

35000 ml

15000 ml

1152-5-0 ml

542-11-6 ml

164317-14-9 ml

795809-6-0 ml

17,03,822 5-3 8,81 788-15 4 66537-3

Ramanathan
Sr. Asst Officer.
Bangalore C y I airage Division
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3.12.45

29/12/45

		1854,170	1299586-10
25	Extending the main outfall from Sunakal farm to Kamangala Tank (12000 feet)	3,60,000	402 878-0-4
26	Land Acquisition for extending the outfall line including contour channel, widening draft channel, breaching the tank and providing distributaries (about 260 acres)	41,30,000	2,49,763-3-9
	~~Total~~	~~26,59,229~~	
	II Channammanakere Valley		
1	Laying Main, Street Sewers, and outfall works of Narasimharaja Colony	65,000	43467-5-0
	III Kempambudhi Valley		
1	Laying sub Main along the 9th cross road, street sewers in Chamarajpet extension, portions of Basavanagudi, Shankarapuram, Sunkenahalli, and New Bharagupet forming 7th Division	1,80,000	83,066-4-8
	IV Magadi Valley		
I	Extending the Malleswaram Main ~~along~~ from the existing Sceptic tank in Hanumanthapuram Burial ground to beyond Magadi Road, including Cost of acquisition	1,15,000	—
Ia)	Eastern Portion - Improvements to existing main, laying sub main, along Seshadripuram Main Road, and joining the existing main in Link Road. Improvements to existing street sewers in places like Seshadripuram, Venkataranganapuram Annappa's Block, Palace Guttahalli, Subedar Chatram, Sripuram, Road Extension and Ranganathapuram extension	3,65,000	1,01,443-15-6½
2	Western Portion of Malleswaram		
	Laying Main Sewer commencing from Labour Colony and joining the existing septic tank and Street Sewers in Nagappa Block, Sriramapuram and Labour Colony.	1,22,000	1,09,332-6-6
		34,91,170	1989537-4-1

50,000	506793-6-11	2809-7-9	
1,35,000	1,22,121-15-8		For constructing sewer upto the head of Koramangala Tank (as per revised proposal)
	1,80,236-2-3		
1500	20,032-11-0		
52,000	44933-11-4		1) Chamrajpet Sub Main 12,000/- 2) St sewers of Chamarajpet 10,000/- 3) Alterations to existing St sewers of Chamarajpet 10,000/- 4) Sunkenahally 20,000/-
1,15,000	nil		
3,28,000/			(1) Eastern portion of Malleswaram 3,00,000/- (2) Malleswaram Main 28,000/-
10,500	2167-10-0		
6,92,000	876286-3-2	66653-7-3	

3	laying Street Sewers Extension	Link Road	34,91,170	19,89.537-1-
			~~14,800~~ 16,258 (Revised)	16257-2
4	Laying a sewer line [redacted] Area for West End	High ground level	10,500	4998-1-
			~~6,27,500~~	
	V Municipal [redacted]			
I	Laying Main and [redacted] Municipalpalyam	Sewers in	35,000	
	VI Public Conveniences			
	Constructing urinals [redacted] tories etc.	& Lava-	15,000	
	VII Survey charges		4,000	2847-11-0
	VIII Surveying and [redacted] Instruments	Mathematical	1,500	957-4-6
	IX Laying Sewers [redacted] areas	undeveloped	1,77,971	13,653-1-3
	X Disposal works	For all outfalls		
I	Treatment works [redacted] Activated sludge plant [redacted] quotations received from [redacted] Bombay, for Koramangala Valley	Complex as per	8,00,000	4190-10-0
			45,51,399	20,32,441-28
	Deductions			
I	Deduct the amount [redacted] in the above estimates for house connections (as per instructions recently received)	provided	4,39,859	
		Balance	41,11,540	
	Details of the [redacted] amount of Estimates [redacted] from time to time,	Balance sanctioned, to date	7,94,846	
	amount of Estimates [redacted] ~~from time to time~~,	sanctioned,	31,30,295	
		Total	41,25,141	

For laying st: sewers Justice by Meiranda of Sri Ramanmandiam Road in IV Ward

43000-0-0

5000 37959-5-9 For laying sewers in Ghenna rayaswamy Temple st and in lane behind B T Rappa to restaurant in Avenue Road

nil

5000 87239 6 1 14

nil 16,440-12-10

9000 43,333-6-0

13000 Nil

nil 0-3-

50,000 50,793-6-11 9-7-9